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CARRIED TRACTOR SPRAYERS

AGS 1000EN-H and AGS 1200EN-H

INSTRUCTIONS FOR USE

AGROMEHANIKA reserves the right to design modifications or product changes, without any liabilities to inform the customer before and after each change.

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SPRAYER AGS 1000, (1200 EN-H) WITH SPRAYING EQUIPMENT 15, 16 and (18MY-H)

EC DECLARATION OF CONFORMITY

Manufacturer:

AGROMEHANIKA, proizvodnja in trgovina Kranj d.d.
Hrastje 52 a, KRANJ, SLOVENIA

declares that the product:

SPRAYER AGS 1000 EN-H

SPRAYER AGS 1200 EN-H

is manufactured in accordance with:

1. **Directive on Machinery 2006/42/EC and Directive 2009/127/EC amending Directive 2006/42/EC with regard to machinery for pesticide application**;
2. **Rules on acquiring certificate on device conformity for apply phyto-pharmaceutical products** (Ur.list RS, nr. 37/2001);
3. **Rules on changes and amendments to rules on acquiring certificate on device conformity for apply phyto-pharmaceutical products** (Ur.list RS, nr. 80/2001);
4. **Rules on changes of rules on acquiring certificate on device conformity for apply phyto-pharmaceutical products** (Ur.list RS, nr. 80/2002).

The following harmonized European standards on safety were applied:

SIST EN ISO 4254-1:2013 – Agricultural machinery – Safety – Part 1: General requirements;

SIST EN ISO 4254-6:2010 – Agricultural machinery – Safety – Part 6: Sprayers and devices for distributing liquid fertilizers (ISO 4254-6:2009);

SIST EN ISO 4254-6:2010/ AC:2011 – Correction AC:2011 to standard SIST EN ISO 4254-6:2010;

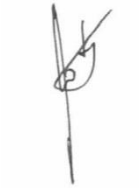
SIST EN ISO 12100:2011 – Machine safety – General principles of planning – Risk assessment and risk reduction (ISO 12100:2010);

SIST EN ISO 13857:2008 – Machine safety – Safe distances, preventing reach of dangerous areas with upper or lower limbs.

Kranj, 04.09.2014

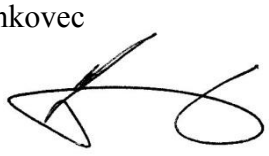
Head of production:
(resp. for. tech. documentation)

Matjaž Kuhar, engineer



Manager:

Jan Šinkovec



CERTIFICATE ON DEVICE CONFORMITY

UNIVERZA V LJUBLJANI *Biotehniška fakulteta*

ODDELEK ZA AGRONOMIJO
CERTIFIKACIJSKI ORGAN
Katedra za fitomedicino, kmetijsko tehniko,
poljedelstvo, travništvo in pašništvo

C E R T I F I K A T

O SKLADNOSTI NAPRAVE ZA NANAŠANJE FITOFARMACEVTSKIH SREDSTEV

1. IME IN NASLOV DOBAVITELJA

a) ime: AGROMEHANIKA, proizvodnja in trgovina KRANJ d.d.

b) naslov: Hrastje 52 a, 4001 KRANJ

2. SERIJSKA ŠT. CERTIFIKATA: UL-BF-54/01 (podaljšanje veljavnosti certifikata)

3. DATUM IZDAJE CERTIFIKATA: 23. 03. 2012

4. VELJAVNOST CERTIFIKATA: 23. 03. 2017

5. IDENTIFIKACIJA PROIZVODA

a) proizvajalca izdelka: AGROMEHANIKA, proizvodnja in trgovina KRANJ d.d.
Hrastje 52 a, 4001 KRANJ

b) oznaka modela ali tipa: Škropilnica

AGS 800 EN, AGS 1000 EN

6. TEHNIČNI PREDPISI, STANDARDI IN DRUGE SPECIFIKACIJE NA KATERE SE CERTIFIKAT NANAŠA:
- **Pravilnik o pridobitvi certifikata o skladnosti za naprave za nanašanje fitofarmacevtskih sredstev (Ur. list RS št. 37/01)**
- **Pravilnik o spremembah in dopolnitvah pravilnika o pridobitvi certifikata o skladnosti za naprave za nanašanje fitofarmacevtskih sredstev (Ur. list RS št. 80/01)**
- **Pravilnik o spremembi pravilnika o pridobitvi certifikata o skladnosti za naprave za nanašanje fitofarmacevtskih sredstev (Ur. list RS št. 80/02, 117/02)**

Podpis:
TEHNIČNI VODJA CERTIFIKACIJSKEGA ORGANA
Prof. dr. Rajko Bernik

Žig

Podpis:

DEKAN
Prof. dr. Mihael Jožef Toman

UNIVERZA V LJUBLJANI *Biotehniška fakulteta*

ODDELEK ZA AGRONOMIJO
CERTIFIKACIJSKI ORGAN
Katedra za kmetijsko tehniko

C E R T I F I K A T

O SKLADNOSTI NAPRAVE ZA NANAŠANJE FITOFARMACEVTSKIH SREDSTEV

1.IME IN NASLOV DOBAVITELJA

a) ime: AGROMEHANIKA, proizvodnja in trgovina KRANJ d.d.

b) naslov: Hrastje 52 a, 4001 KRANJ

2. SERIJSKA ŠT. CERTIFIKATA: UL-BF-168/08

3. DATUM IZDAJE CERTIFIKATA: 10.06. 2008

4. VELJAVNOST CERTIFIKATA: 10.06. 2013

5. IDENTIFIKACIJA PROIZVODA

a) proizvajalca izdelka: AGROMEHANIKA, proizvodnja in trgovina KRANJ d.d.
Hrastje 52 a, 4001 KRANJ

b) oznaka modela ali tipa: Škropilnica

AGS 1200 EN

6. TEHNIČNI PREDPISI, STANDARDI IN DRUGE SPECIFIKACIJE NA KATERE SE CERTIFIKAT NANAŠA:

- Pravilnik o pridobitvi certifikata o skladnosti za naprave za nanašanje fitofarmacevtskih sredstev (Ur. list RS št. 37/01)
- Pravilnik o spremembah in dopolnitvah pravilnika o pridobitvi certifikata o skladnosti za naprave za nanašanje fitofarmacevtskih sredstev (Ur. list RS št. 80/01)
- Pravilnik o spremembi pravilnika o pridobitvi certifikata o skladnosti za naprave za nanašanje fitofarmacevtskih sredstev (Ur. list RS št. 80/02, 117/02)

Podpis:
TEHNIČNI VODJA CERTIFIKACIJSKEGA ORGANA
Prof. dr. Rajko Bernik

Žig

Podpis:

DEKAN
Prof. dr. Janez Hribar

We thank you for the trust, given when choosing our spraying device AGROMEHANIKA for chemical protection of plants. Reliability and performance of the device depends on your care for the device. Before connecting the spraying device to a tractor carefully read the instructions for use and heed to them, while operating the machine. Instructions contain essential information on effective and safe use and long life of the machine.

1 GENERAL

Spraying device is designed and constructed for applying chemical products in water-based solution, which are normally used for chemical protection of crops, on field crops. Construction design enables access to all vital elements of the sprayer and easy handling. Robust construction, quality component parts and a great deal of additional equipment enable the user to work reliably and use spraying agents and energy optimally. Spraying device is not to be used for pumping or spraying of:

- water-based solutions with greater specific weight and viscosity than water;
- chemical solutions, whose compatibility with elements, built on the spraying device, is not reliable;
- drinking water;
- sea water and other saline solutions;
- water, with temperature exceeding 40 °C or lower than 5 °C;
- any kind of varnish or patina;
- quick acting diluters;
- oils and greases;
- liquids, containing granulates or floating hard particles.

2 HEALTH-SAFETY WARNINGS AND MEASURES

2.1 SAFETY SIGNS

Sign on the left is a warning safety sign and is normally located on the machine with other signs.
Respect instructions for safe work and act accordingly in extreme situations.

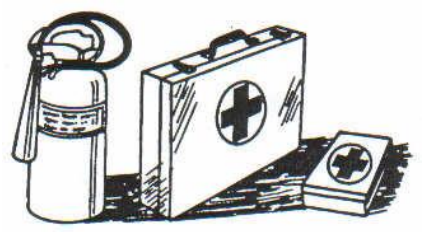
2.2 MAINTENANCE OF SAFETY SIGNS

Carefully read instructions, regarding safety regulations, described in instructions for use of your machine. Ensure that the signs are clearly visible on the machine. After repairing the machine and changing component parts, make sure that the machine includes all required safety signs. Safety signs are available from authorized dealers. Learn the operation of your machine and proper handling and control units.

DO NOT ALLOW UNAUTHORIZED PERSONS TO USE THE MACHINE!

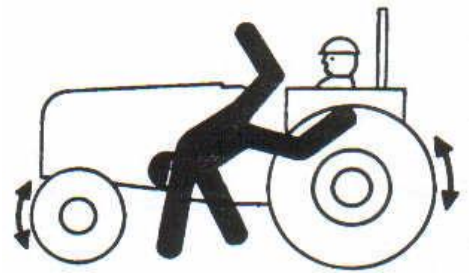
Ensure that your machine is in good technical condition. Each unauthorized change to the machine can diminish its function, as well as safe operation, and can shorten its life span.

2.3 READINESS FOR DANGER



Be prepared for sudden fire.
Make sure that a first aid kit and a fire extinguisher are always at hand, when working.
Make sure that you have phone numbers of your doctor, emergency, clinic, hospital and fire service written in a visible location.

2.4 REMOVING UNAUTHORIZED PERSONS



Every unauthorized person, riding on the machine, can have an accident (a fall from the machine or an injury by the machine). Person, riding on the machine, can affect the driver, who is controlling the machine, and can change the machine's barycentre. Person on the machine obstructs overview of the driver and can contribute to unreliable working conditions on the machine. Do not allow unauthorized persons to gain access to the machine.

DRIVING UNAUTHORIZED PERSONS ON THE MACHINE IS PROHIBITED!

2.5 SAFETY IN HANDLING WITH CHEMICAL PRODUCTS

Handle chemical products extremely carefully, to avoid potential injuries and dangers to health, as well as to the environment:

- Be very careful, when handling chemical products. Ensure that you do not have direct contact with chemical products. Handle chemical products as you would poisons.
- Choose chemical products, which are least dangerous to your health, most effective and easy soluble.
- Always read instructions for use, given on the chemical products. Regard regulations, safety measures and use instructions.
- When working, use respiratory protection, such as gas mask, helmet with fresh air.
- When preparing chemical products, wear appropriate clothing. When working, use protection mask, gloves, boots and protection clothing. Be careful with your protection equipment. Do not use "worn-out" protection.
- Make sure that your protection equipment and clothing is in good condition. Dirty gas mask can cause skin irritation. Change the filter regularly!
- Choose "safer" chemical products. When choosing chemical products, use products that are less irritant to the skin and do not cause dust.
- When choosing chemical products, prefer products, which have "safer" packaging;

- Prepare chemical products in the fresh air. When preparing products, turn off the machine to reduce the risk of spilling chemical products.
- Prepare chemical products in a wind-free environment or a calm location.
- Make sure that the machine is regularly cleaned, to reduce the possibility of direct contact with chemicals.
- During preparation and mixing of chemical products, use tools, intended for this purposes, litre scale, measuring tools, funnel, bucket. Regularly clean tools.
- Do not prepare more chemical products than needed.
- Make sure that your working day of using chemical products does not exceed eight hours. Avoid stress and great physical strains.
- Before spraying and eight hours after spraying do not drink alcohol.
- During work with chemical products, do not eat, drink or smoke.
- Do not try to free clogged nozzles by blowing with mouth.
- In the spraying period, heed to spray waiting period.
- In case of contact of chemical products with eyes, immediately rinse them with clean water.
- After spraying, wash your hands and face well before ingesting food and liquids.
- Disable children and animals to access the machine, until it is properly cleaned.
- After use, clean the machine properly and store it in a suitable place, so that unauthorized persons do not have access.
- After working with chemical products take a thorough bath.
- Clean and wash the machine after each use and before each maintenance procedure.
- If you have any health issues while dealing with chemical products, consult your physician and try to contact the dealer of the chemical product.
- If you have had an accident with a chemical product, we propose the following safety measures:
  - Eyes and skin: rinse with plenty of clean water,
  - Throat and oesophagus: drink water (not milk!!!),
  - Respiratory paths: fresh air.

2.6 LABELS FOR DANGER, ACCORDING TO DANGER LEVEL

Packaging of chemical products contains danger signs, which express the danger level. If possible, avoid chemical products, which have a skull symbol on their packaging or other symbols, warning about chemically corroding effect. If the packaging has no symbols for danger, this does not mean the chemical product is not harmful or dangerous. Even if you use chemical products without danger labels on their packaging, you have to be extremely careful, because they can be harmful to your health in case of long-term handling.

Danger signs which can be seen on packaging of chemical products:

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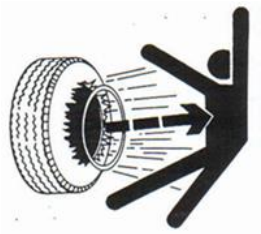
1. poisonous materials – in case of poisons or very toxic chemical products;
2. harmful and irritable materials – if chemical products are harmful to your health and irritating to your skin;
3. corrosive materials – all chemical products which have an etching effect;
4. oxidising materials – chemical products which have an oxidising effect;
5. inflammable materials – chemical products which are inflammable;
6. Explosive materials – chemical products which can explode.

2.7 DANGER OF MECHANICAL INJURIES



- do not touch the machine while operating;
- do not remove safety labels or any other safety equipment of the machine;
- do not exceed air pressure in the tyres;
- maintain the tyres regularly;
- if using the machine in the public traffic you must fit it with lights and other illuminates in accordance with traffic regulations;
- do not enter the tank while preparing or cleaning;
- never set working pressure above 15 bar (maximum allowed working pressure);
- do not start working until you are sure that there are no unauthorized people in the vicinity of the machine;
- pull out the key from the key-lock after you have finished working to prevent sudden, unwanted start of the machine.

2.8 DANGERS, CAUSED BY LIQUIDS UNDER HIGH PRESSURE

- Liquids, leaking from the pipes, can be under high pressure and can cause injuries to your skin, and cause dangerous injuries, if they spread under your skin.
  Never try to dismount a hydraulic pipe or any other of the hydraulic installation as long as this one is under high pressure. Before you start up the hydraulic system make sure that the installation is safe.
- Help yourself with a piece of cardboard when trying to find the place of leakage. Protect your hands and body by means of gloves and protective clothing if you are handling a high pressure hydraulic system.
- In case of injury, seek medical attention. To prevent severe injuries, each penetration through the skin must be stopped and liquids must be removed within a few hours.

2.9 WORKING PLACE OF OPERATOR

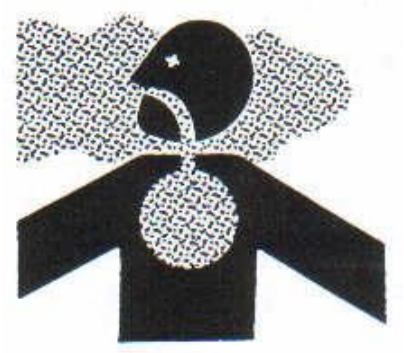
- There is only one person required to operate the machine. This person is also the tractor driver.
- This machine can be operated by a person older than 18 years and has the know-how that is needed for safe and accurate operation of spraying appliances and products.
- The person needs to be in good health – mentally and physically.
- Operational work and maintaining of the sprayer can only be carried out by authorized personnel, which is qualified for this type of work.
- Machine operator must undergo medical examination (in accordance with local regulations).
- The working place of the operator is 1 meter around the machine and tractor.
- While spraying keep the windows and doors of the tractor closed. It is recommended that the operator has a hermetically closed cabin which allows the operator to create overpressure with aeration of fresh air that disables chemically polluted air to enter the cabin.
- While spraying, it is recommended that the operator stays in the cabin for about 90-95% of the time, so the chemical products cannot have influence on his or hers health. Should the operator notice a change in the working of his or hers organs or feel sick, he or she should immediately put on the protection breathing mask. However, the best thing to do is to leave the field and look for shelter in a cleaner area.

2.10 PERSONAL PROTECTION

- machine operator must use well closed clothing and effective protection equipment during work.
- The operator can come in contact with chemicals through his or her skin, mouth or nose. If you do not work safely even the best protection equipment cannot be of any use to you.
- Safe work with sprayers requires full attention of machine operator, therefore, do not listen to music with headphones on while working.

	WARNING: To prevent inhaling and/or entering the chemicals through the mouth it is recommended not to eat, drink or smoke while working!

2.11 PROTECTION OF RESPIRATORY SYSTEM



There are many different filter and protections masks available to protect your respiratory system.

- It is recommended to use masks that protect the whole face and are fitted with combinations of different filters (filter for gas-smoke). An even more efficient protection can be achieved by means of a protection helmet in which overpressure can be created.

- Make sure that you are using an appropriate filter:
  - A (brown): used for most organic chemicals;
  - B (grey): used for most inorganic chemicals;
  - P (white): used only for liquid or powder chemicals;
  - Combination of a brown/white filter with the mark A2P2 in the European Union is be used for most organic chemicals. The mark A2P2 refers to a combination of filters which provide appropriate protection against most gases and vapours that are created by using liquid or powder chemicals. A2 refers to protection class (2) which means that you can use the filter until it reaches a concentration of 0.5 volume-percentages. P2 refers to gas protection class (2).
  - The combination B (grey/white) filter must be used in the case of handling inorganic chemicals.
  - Before using the mask check the tightness and sealing of it. Check the mask for damages and make sure that the outer valve is clean and can be closed without any problems.
- Write down the date of the last usage of the filter. The A2P2 filter must be replaced once a month nevertheless how many times it was used. Filter B must be replaced after every single use! The filter must be used within 6 months after the packaging of the filter was opened. Make sure that used filters are destroyed in accordance with local regulations.
- Never check the efficiency of the filter by smelling:
  - certain poisonous elements are odourless,
  - the concentration of the poison cannot always be noticed by human nose,
  - smelling of certain elements can damage the nasal mucous membrane.
- Always check the expiry date of the filter.

	WARNING: The filter must be hermetically sealed after use!

2.12 SKIN PROTECTION

Wear following clothing to protect your skin:

- Rubber gloves for agriculture and gardening to protect your hands, which must be long enough. If the gloves are worn out they need to be replaced. Change the gloves after every fifth use. Powder the inside of the gloves.
- Rubber or neoprene boots that are resistant to water and chemicals.
- Overalls that are resistant to water and chemicals and are fitted with a hood. The overall must cover the ends of gloves and boots.
- A waterproof apron for protection of your clothes; in a well-protected tractor cabin the apron can be removed.
- A mask that protects the whole face.

Make sure that all of your clothes are well cleaned after every use. Never perform spraying when your clothes are wet, since it can cause a strong contact with your skin. Be very careful in the case your skin gets injured. After handling chemicals always wash your hands with soap and loads of water. After you have finished working also wash your face.

2.13 MAINTAINING PROTECTION EQUIPMENT

After every single use thoroughly clean your protection equipment. Wash the mask, boots, gloves and working overall with mild soap water and let them dry.
Store your protection equipment in a dry, cold and clean room. Never store your protection equipment in the same room as the chemicals. Store your protection clothes apart from other clothes. Protection equipment that gets dirty between handling chemicals must be cleaned in accordance with regulations on cleaning of dangerous materials.

2.14 SAFE OPERATION

Before starting working the operator must check the correct and safe operation of the machine.

- It is not allowed to spray in foggy and rainy weather or when the wind speed exceeds 4 m/s. The direction of spraying must be adjusted to the wind direction.
- If there are two tractors with spraying appliances working simultaneously, they must not pollute each other's working area atmosphere.
- Never bring personal things in the area of spraying or when handling chemicals. Before every meal thoroughly clean your hands and face and wash out your mouth with fresh water.
- Before using chemicals, check machine operation with clean water.
- The sprayer pump receives the power from the connecting shaft of the tractor by means of the cardan shaft. Drive parts can cause serious injuries so, in order to avoid that , follow the instructions below:
  - To drive the pump a cardan shaft must be used which characteristics are in accordance with the recommendations of the manufacturer and is fitted with a protection cover.
  - Connect the machine to the tractor only if the drive shaft (PTO) is turned off.
  - Connecting and disconnecting of the cardan shaft must be performed only when the engine is shut off.
  - Before activating the drive shaft (PTO) check the number of revolutions and make sure that there are no people or animals in the danger area of the machine.
  - The cardan shaft should be cleaned and greased only when the drive shaft (PTO) is turned off, the engine shut down and the start key removed.
  - Do not engage the drive shaft of the tractor (PTO) without a reason and check if the difference of cardan joint angles is not excessive.

	WARNING: Do not engage the drive shaft of the tractor (PTO) with the engine not running!

2.15 SAFE MAINTENANCE

- Before starting to operate the machine learn how to maintain it.
- Keep the working place clean and dry.
- Do not grease, maintain or adjust the machine while it is moving! Do not touch moving parts of the machine! Turn off the machine and make sure that there is no working pressure in the circulation of the chemicals!
- Do not maintain or service the machine before it is thoroughly cleaned.
- During maintenance and servicing of the machine, remove the start key or disconnect the connections.
- Disconnect the drive shaft of the tractor (PTO) to prevent sudden actuation and operation of the machine.
- Do not inspect the machine without "turning on" safety elements.
- Do not perform reparatory welding on the machine, if you have used ammonium nitrate or any other liquid that contains ammonium nitrate for spraying without having thoroughly cleaned the machine before.
- Do not enter the reservoir to repair or clean it.
- Support and safely mount all parts that need to be lifted during maintenance.
- Keep all of the sprayer’s parts in good condition. Repair damages immediately. Replace worn and damaged parts. Remove excess oil, grease or any other debris.
- Disconnect the battery before you start to adjust the electrical system or perform welding on the machine.

- During maintenance of the machine or cleaning the nozzles use appropriate protection equipment in accordance with the regulations.
- It is strictly forbidden to release chemicals into the environment.

2.16 ROAD TRANSPORT

Do not drive the machine on public roads. If you have to, you must consider the following instructions:

- Sprayer, connected to the tractor, can only be transported on the road, when the reservoir contains no chemical products.
- Connect the sprayer to the tractor only if the load on the wheels does not exceed the set maximum weight. After connecting the machine, at least 20 % of the tractor's weight must be on driven wheels. You can achieve these values by adding weights at the front and removing weights at the back of the tractor. You can decide on this on the basis of weighing before first operation.
- Sprayer can completely or partially cover the lights and signs on the tractor. In such case, the machine must be fitted with light signals and warnings.
- During road transport of sprayer with the tractor, follow traffic regulations.
- During road transport, spraying equipment must be raised to appropriate height. Fix the 3-point hitch in the raised position to prevent sudden fall or slip of the machine and lateral swinging.

2.17 PROCEDURES IN ACCIDENTS WITH CHEMICALS

If your skin or eyes come in contact with chemicals or their solution, wash them out with plenty of water and repeat the process several times.
In the case of suspected poisoning (symptoms: sweating, dizziness, depression, headache, sickness):

- immediately stop working;
- take off wet clothes;
- remain calm;
- if you feel sick because of consumption of chemicals try to throw up;
- lay on your side;
- immediately call for medical help and let the physician see the label of the chemical, so he or she will be able to determine the type of poisoning easier.

In case of suspected poisoning the patient must not eat or drink castor oil, milk, butter, eggs and alcohol, since these ingredients worsen the poisoning effect.

2.18 REGULATIONS REGARDING MACHINE USE

Machine operator and user must be familiar with regulations regarding plant protection.

3 SAFETY SIGNS ON MACHINE AND INSTRUCTIONS FOR USE

Machine and instructions for use contain safety and warning signs. Take a closer look to ensure your safety. Follow instructions and guidelines, referring to safety measures, given in the previous chapter. Ensure that the safety signs are well visible. Ensure that you have all required signs after servicing or replacement of parts. Safety signs are available at authorized dealers.

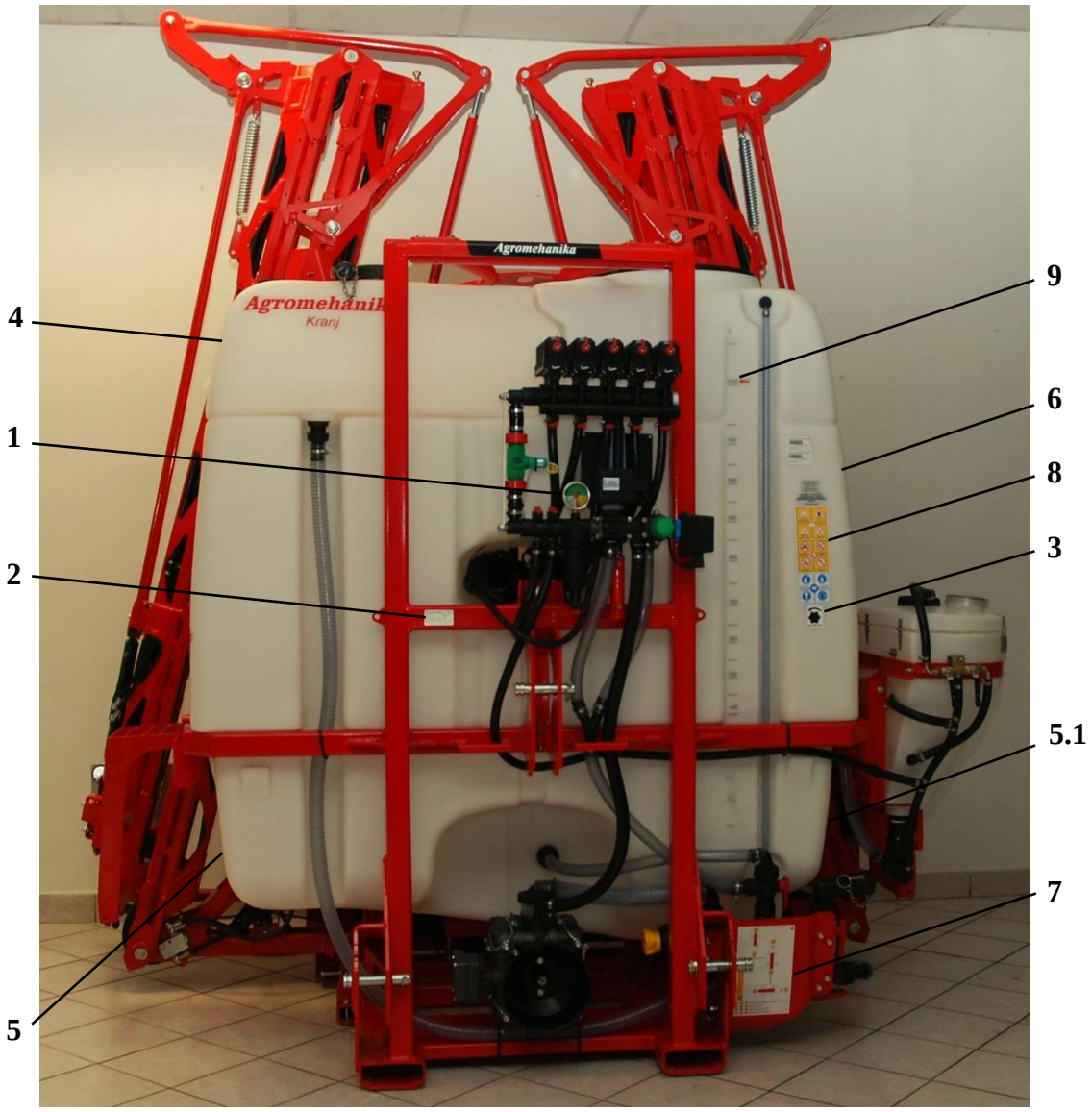


Figure 3.1

Legend:

1. Manometer
2. Identification plate
3. Sign for number of revolutions of tractor's drive shaft (PTO)
4. Sign for reservoir, intended for washing of hands (filled with clean water)
5. /5.1 Instructions for use of support legs R+L
6. Selection table for nozzles
7. Valve function scheme
8. General safety signs
9. Litre scale

Learn how to operate the machine well and never allow people to operate the machine who are not familiar with the instructions manual! The table below contains descriptions of different safety signs.

CE	CE declaration of conformity		Warning: Presence of poisonous chemical products!
	Warning: symbol, indicating possibility of personal injury or damage of the machine!		Warning: Maximal allowed pressure in the spraying device (12 bar)!
	Warning: keep away from rotating drive shafts!		Warning: Direction of cardan shaft rotation.
	Warning: read the instruction manual before connecting the device to the tractor for the first time!		It is prohibited to clean, grease or maintain the device as long as it is running!
	Prohibitions!		It is not prohibited to smoke while working!
	It is prohibited to remove any of the safety devices on the machine!		It is prohibited to enter the reservoir!
	Recommendations.		If the cabin of the tractor is not constructed in an appropriate way, use your gas mask while working.
	Use protective gloves while working.		Use protection clothing while working.
	Use ear protection while working (applies only to sprayers).		Water for washing of hands. **Warning: this water is not drinkable!**

4 DESCRIPTION

Sprayers type AGS 1000EN-H and AGS 1200EN-H have a modern design with a thin polyethylene reservoir, with rounded edges, smooth inner walls and a sloping bottom. The construction assures a short centre of gravity between the tractor and the sprayer, good insecticide mixing, easy cleaning and complete emptying of the reservoir.
The sprayer consists of: a carrying frame with a polyethylene reservoir and a pouring sieve which are resistant to chemicals, a pump, a flow and pressure regulator, a suction filter, a pressure filter, three-way valves and a lifting mechanism with a lifting gear. The standard equipment includes an additional reservoir for cleaning of the sprayer after finished working and a reservoir for clean water which is intended for washing of hands.
These two types of sprayers can be connected with spraying equipment 15 MY-H, 16MY-H and 18MY-H.
The following instructions include detailed information on sprayer's component parts and how to handle them; the second part of this manual includes a catalogue of spare parts.

4.1 LIFTING POINTS

When loading or unloading the sprayer onto or from the truck, use the standard lifting points of the three-point system on the sprayer or opening on the carrying frame.

1. Three-point system
2. Opening for loading (forklift).

Figure 4.1

4.2 SPRAYER COMPONENT PARTS

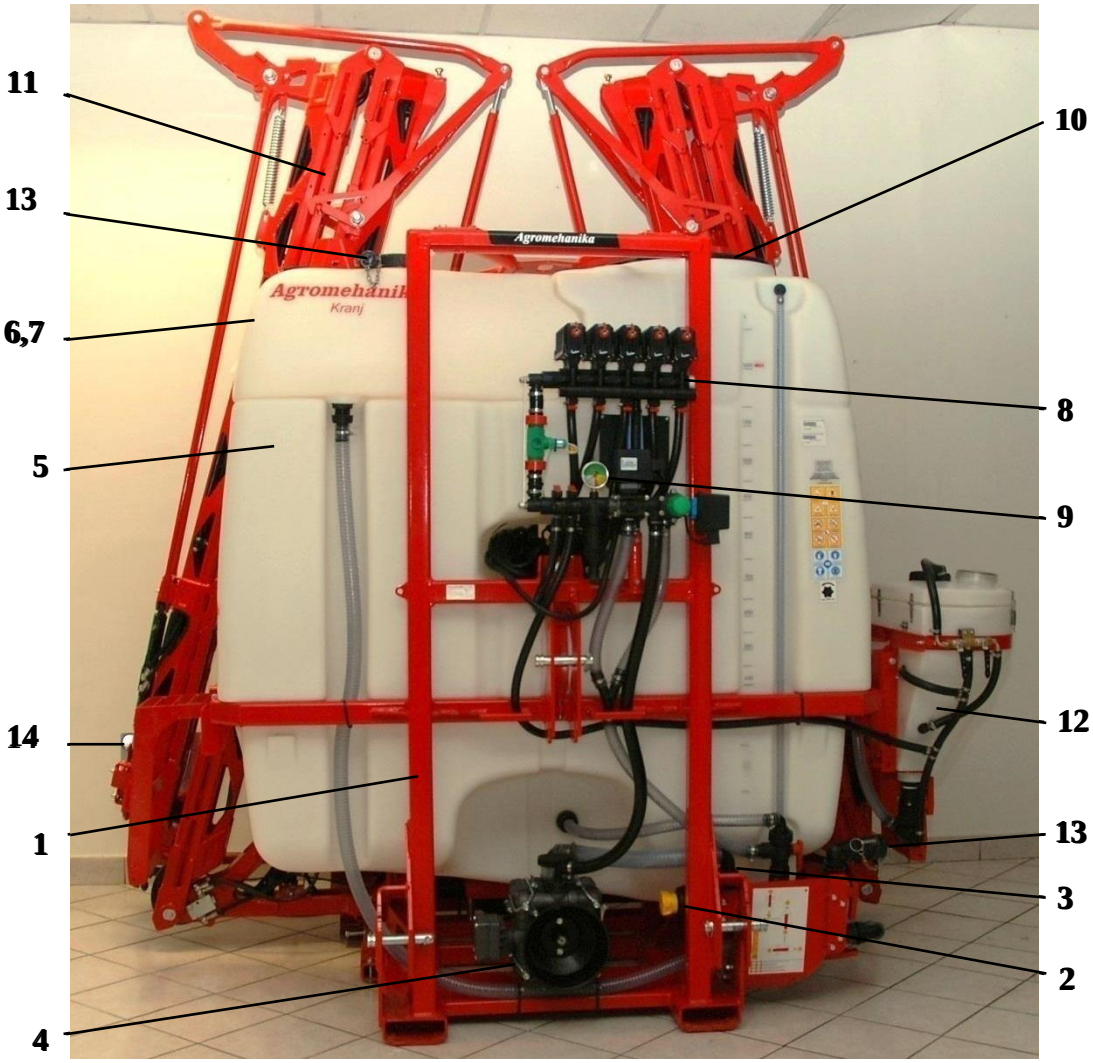


Figure 4.2

Legend:

1 - carrying frame
2 - suction filter
3 - three-way valve
4 - pump
5 - main reservoir
6 - reservoir for rinsing
7 - clean water reservoir
8 - pressure regulator
9 - manometer
10- pouring sieve
11- hydraulic spraying equipment TIP H (15, 16, 18 m)
12- filling container 30 l
13- connection for reservoir filling
14- light signals

4.3 MACHINE IDENTIFICATION

4.3.1 MACHINE IDENTIFICATION PLATE

Attached to the front side of the sprayers and contains following important information:

- address of manufacturer and country of origin,
- product type,
- model,
- nominal volume,
- empty machine weight,
- allowed total weight,
- allowed max. working pressure,
- required power of drive,
- production year and
- serial number.

Along with given information, identification plate also contains a hexagon, informing that the machine is certified or manufactured in accordance with legislative provisions on machine equipment for application of phyto-pharmaceutical products.

4.3.2 SPRAYING EQUIPMENT IDENTIFICATION PLATE

Attached to the central part (shoulder) of spraying equipment and contains following important information:

- address of manufacturer and country of origin,
- product type,
- model,
- allowed max. working pressure,
- weight,
- production year and
- serial number.

4.3.3 PUMP IDENTIFICATION PLATE

Attached to visible part on the pump and contains:

- address of manufacturer and country of origin,
- pump type,
- nominal flow,
- max. flow at maximum allowed rotation frequency and maximum allowed working pressure,
- required power of drive,
- type of lubricant in the pump and
- serial number of pump.

When ordering spare parts, all of the information written on the identification plate must be given to the seller.

4.4 FUNCTION SCHEME

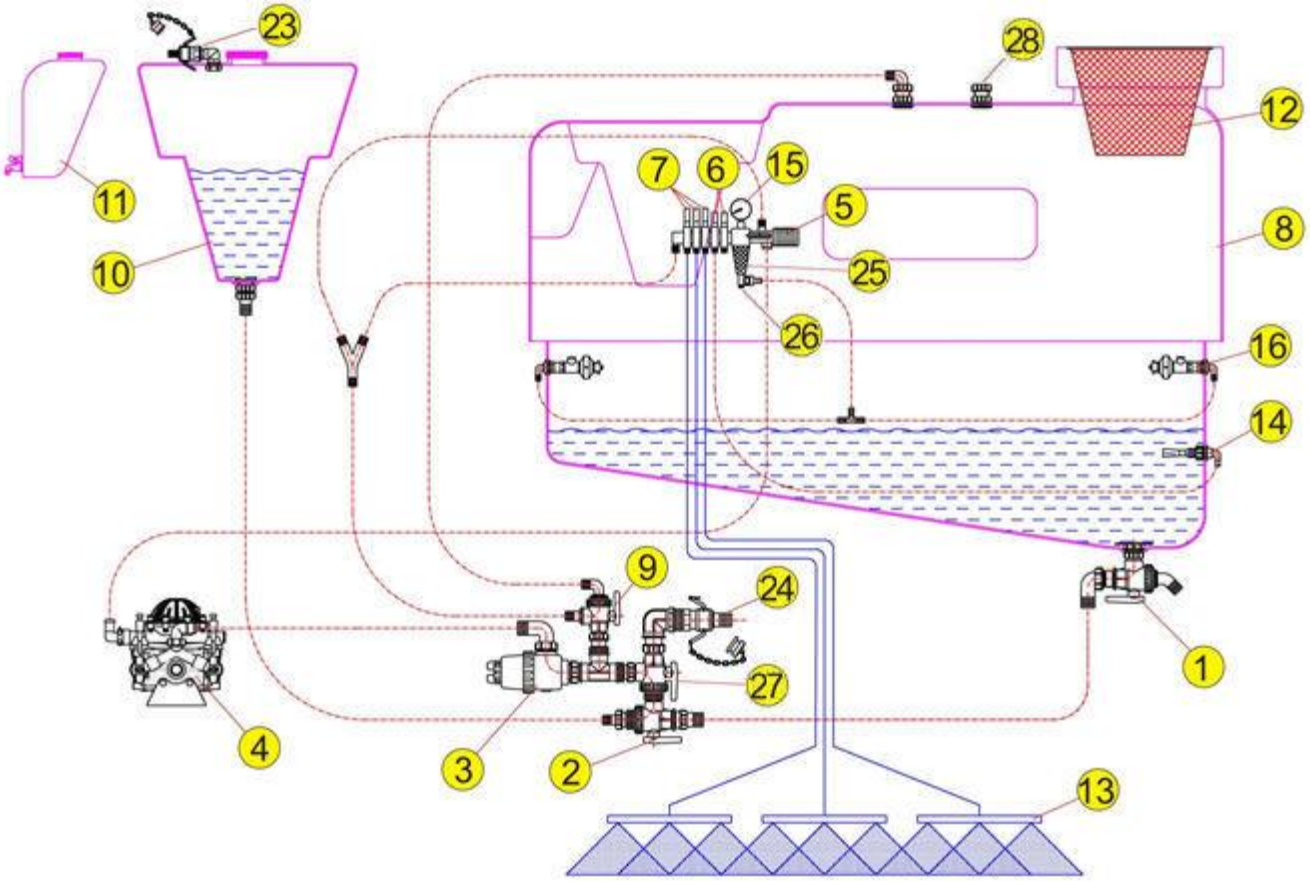


Figure 4.3

Legend:

1. Three-way selection valve with release
2. Three-way selection valve
3. Suction filter
4. Pump
5. Pressure regulator
6. Mixing nozzle feeding valve
7. Valves for opening individual sections for spraying
8. Main reservoir
9. Selection valve
10. Rinsing reservoir
11. Clean water reservoir (to wash hands)
12. Pouring sieve
13. Nozzles
14. Mixing nozzle
15. Manometer
16. Nozzle for reservoir rinsing
23. Bayonet connection for suction hose Ø 19 mm, for filling additional reservoir with clean water
24. Bayonet connection for suction hose Ø 40 mm, for filling main reservoir
25. Pressure filter
26. Valve of self-cleaning filter and rinsing nozzles
27. Three-way valve for suction through pump
28. Connection for filling container

4.5 ADDITIONAL EQUIPMENT

Spraying device can be fitted with additional elements:

- set for exterior washing of spraying device;
- suction basket with suction hose 5 m;
- marker;
- connection for quick filling from hydrant;
- satellite navigation (GPS);
- quick connection

5 CONNECTING SPRAYER TO TRACTOR

Sprayers are constructed for connection to tractor three-point system of category II (diameter of bolts is 28 mm). Mount the sprayer in the tractor's three-point connection system and secure it with the pins. After that, lift the sprayer to a height where both the connection of the tractor and the sprayer are on the same height and connect them with the cardan shaft.

Figure 5.1

	WARNING: Consider the weight of full sprayer at first lift!

General recommendations are the following:

- increase tyre pressure (see instructions for use of the tractor);
- make sure that the pressure regulator does not hit the tractor's cabin or any other part of the tractor;
- make sure that the tractor and the pressure regulator are not touching;
- if necessary, attach some weights to the front of the tractor (see instructions for use of the tractor);
- slow down when driving with a full reservoir (breaking effect is decreased).

5.1 QUICK CONNECTION OF SPRAYER TO TRACTOR

Mechanism system on the connection of sprayer is designed to lock automatically, as soon as connection booms of tractor reach adequate height of position by lifting. Then, as with standard connection, lift the sprayer that the cardan connections of pump and tractor are at the same height and connect them with cardan shaft. To disconnect the sprayer from the tractor, repeat the procedure in reverse order (figure 5.3).

Figure 5.2

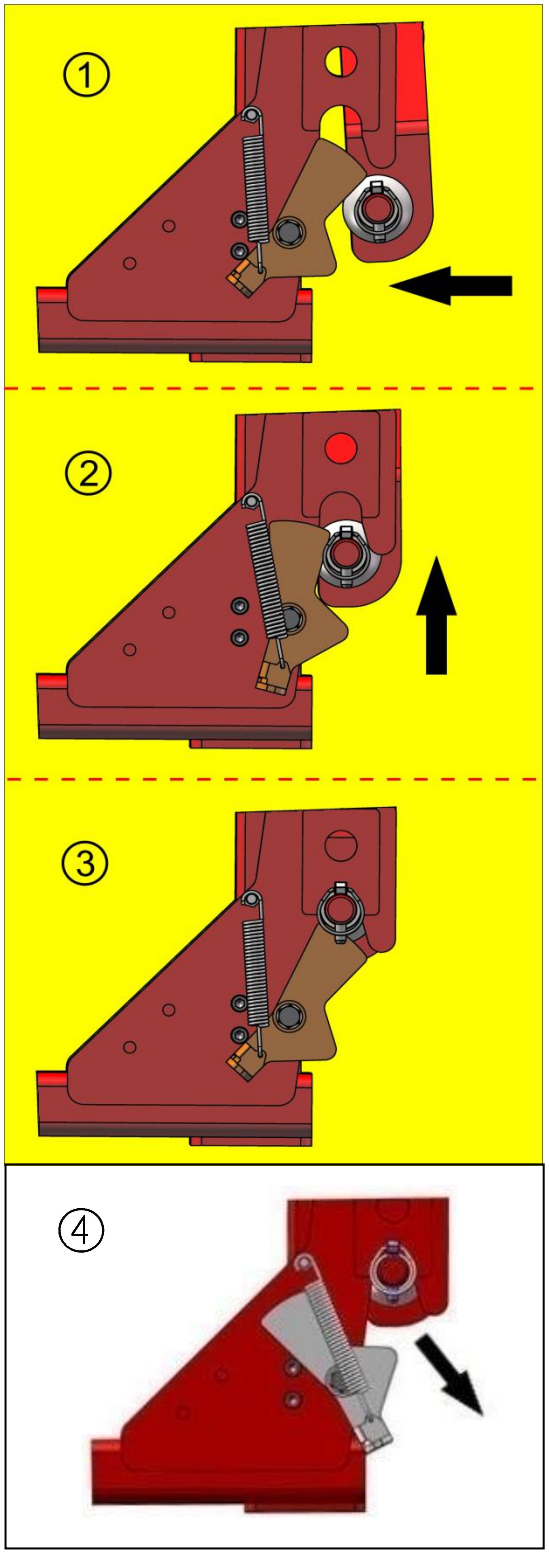
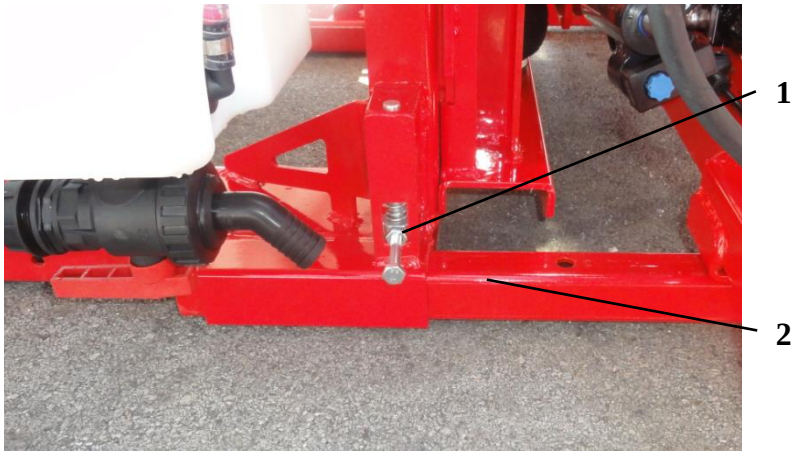


Figure 5.3

5.2 BOTTOM SUPPORT LEGS

Before you lower the sprayer to the ground, make sure that the bottom legs are in extended position, and then lower the sprayer and disconnect it. Perform the procedure by lifting the safety lever (1), and pulling out the leg (2) so that the pin on the lever locks. To set the leg in its original position for transport, perform this procedure in reverse order. Terrain, on which you set the sprayer, must be flat and solid. Bottom legs enables good position and stability of sprayer in self-standing position, **therefore it is required that you perform this procedure every time you disconnect the sprayer from the tractor.**



1. Safety lever for activating bottom leg
2. Adjustable bottom leg

Figure 5.4

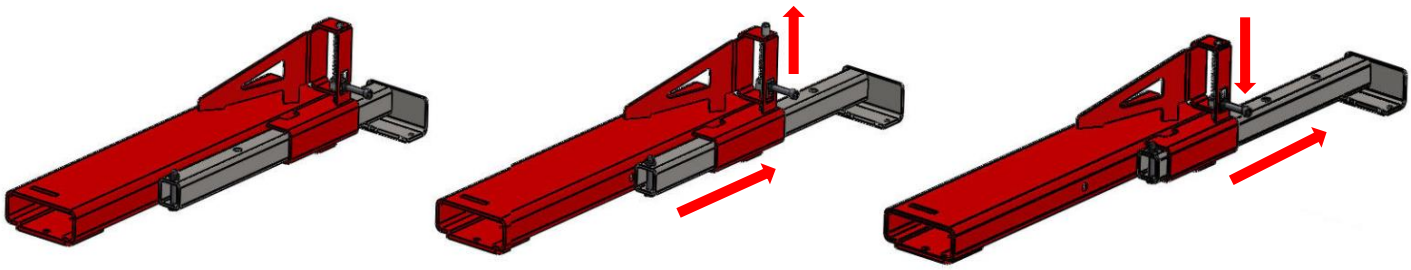


Figure 5.5

	WARNING: In case of failure to comply, overturning can occur, which can cause serious injury to passers-by and damage to the sprayer.

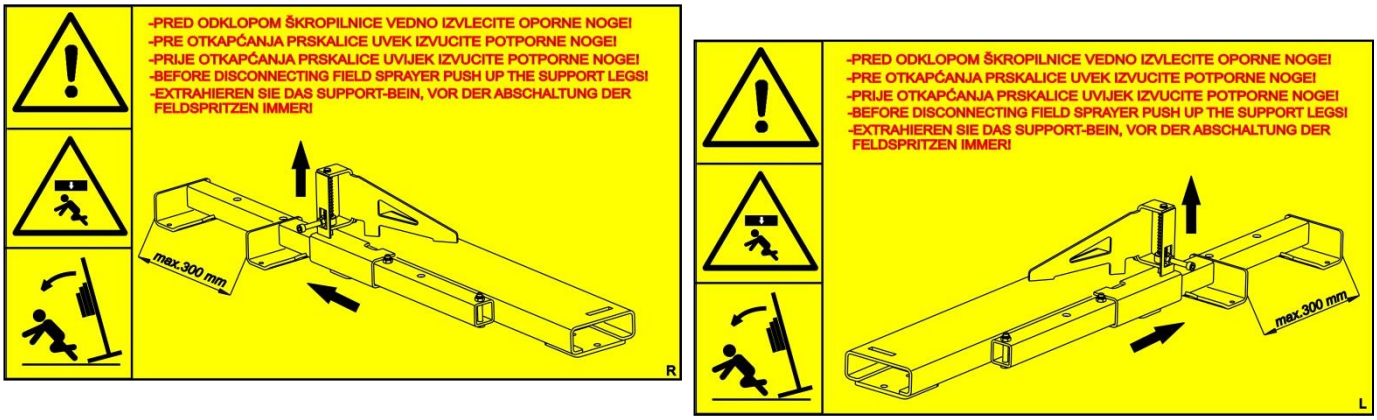

-PRED ODKLOPOM ŠKROPILNICE VEDNO IZVLECITE OPORNE NOGE!
-PRE OTKAPĆANJA PRSKALICE UVEK IZVUCITE POTPORNE NOGE!
-PRIJE OTKAPĆANJA PRSKALICE UVIJEK IZVUCITE POTPORNE NOGE!
-BEFORE DISCONNECTING FIELD SPRAYER PUSH UP THE SUPPORT LEGS!
-EXTRAHIEREN SIE DAS SUPPORT-BEIN, VOR DER ABSCHALTUNG DER FELDSPRITZEN IMMER!
max.300 mm
R
-PRED ODKLOPOM ŠKROPILNICE VEDNO IZVLECITE OPORNE NOGE!
-PRE OTKAPĆANJA PRSKALICE UVEK IZVUCITE POTPORNE NOGE!
-PRIJE OTKAPĆANJA PRSKALICE UVIJEK IZVUCITE POTPORNE NOGE!
-BEFORE DISCONNECTING FIELD SPRAYER PUSH UP THE SUPPORT LEGS!
-EXTRAHIEREN SIE DAS SUPPORT-BEIN, VOR DER ABSCHALTUNG DER FELDSPRITZEN IMMER!
max.300 mm
L

Figure 5.6

6 DRIVE – CARDAN SHAFT (NOT INCLUDED)

6.1 OPERATOR'S SAFETY

	WARNING: To avoid accidents and personal injuries, follow these recommendations and safety regulations!

- Before mounting (connecting of the cardan shaft to the tractor and the sprayer) the drive shaft – cardan shaft, **always turn off the engine and remove the start key from its lock**.
- When mounting the cardan shaft, the cardan shaft of the tractor can be easily turned if the engine and the cardan shaft are turned off.
- When mounting the cardan shaft make sure that the safety pin is in right position and well stuck in its hole. Pull and push the cardan shaft forwards and backwards as long as the safety pin is not in its hole.
- Rotating shafts without protection can be very dangerous!
- Always make sure that all of the safety devices are on their place and that all of the rotating surfaces are well covered, including the "junctions" of the cardan shaft on both ends! Do not use cardan shafts without protection!
- Do not touch rotating cardan shafts! The safety distance to a rotating cardan should not be less than 1.5 m.
- Secure protection elements with chain from turning!
- Make sure that the protection of the cardan on the tractor and connection is well connected (attached)!

6.2 CONNECTION OF CARDAN SHAFT

The first mounting of the cardan shaft should be performed as follows:

1. Mount the sprayer to the tractor and lift the tractor's lift arms to such a height, where the distance between the tractor's connection shaft and the sprayer's connection shaft is the **shortest (both connection shafts are on the same height).** Be careful not to hit the sprayer against the tractor or the ground.
2. Stop the tractor's engine and remove the start key.

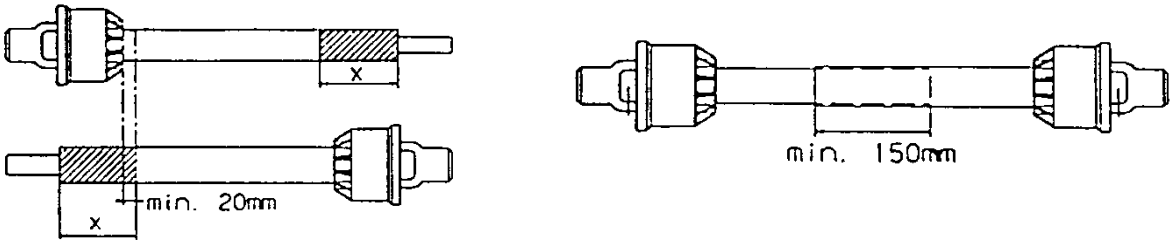


Figure 6.1

3. Use the cardan shaft to connect drive output shaft of the tractor and input shaft on the sprayer's pump.
4. In the case the cardan shaft is too long and needs to be shortened, pull out the cardan shaft and mount each end of it separately to the shaft of the tractor and to the shaft of the sprayer, measure it out and mark the place where it needs to be cut.
5. Use an appropriate tool to shorten both parts in the same way and remove sharp edges.

	WARNING: The mutual covering of both cardan shafts must be at least 150 mm!

6. Attach profiles and connect both parts of the cardan shaft.

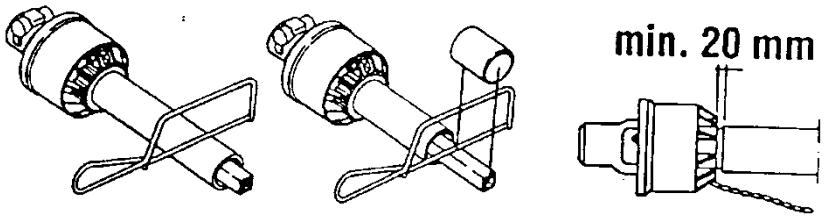
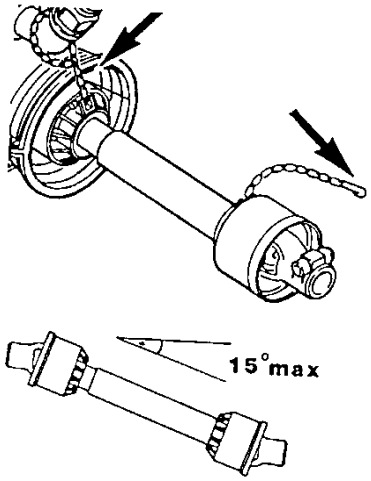


Figure 6.2

7. Mount the cardan shaft between the tractor and the sprayer.



8. To ensure a long reliability of the cardan shaft, avoid angles larger than 15°.
9. When using safety cardan shafts, fit an Allen screw with torque of 40 Nm. Check the torque after two (2) minutes of operation.

Figure 6.3

	WARNING: Always mount the female end of the cardan shaft to the tractor! Connect the chains in order to prevent rotation of safety covers!

7 DETAILED DESCRIPTION WITH INSTRUCTIONS FOR WORK

The frame is made of a steel welded construction which comprises a reservoir, a pump that is attached to the lower part of the frame, a suction filter and valves for flow regulation. The pressure regulator is attached to the front of the construction, the lifting mechanism to which the spraying equipment is attached to, is located in the back. Both the reservoir for rinsing and the clean water reservoir are fitted above the main reservoir.

7.1 MAIN RESERVOIR

The main reservoir is made of polyethylene which is resistant to chemicals. It has rounded edges and smooth inner walls for easier cleaning. The reservoir has a sloping bottom which assures a complete emptying of it. There is a sieve with cover mounted on the top of the reservoir. Do not remove the sieve while filling the reservoir with insecticide or water!

	WARNING: Use protective equipment when handling sprays!

A litre scale is engraved at the front side of the reservoir, with a transparent hose, in which a red ball moves freely (floats) for easier visual reading of the quantity of the chemical agent inside the reservoir.

The cover consists of one part with lever, through which the float valve mechanism for ensuring aeration and prevention of water leaking from the reservoir on the bottom side. The cover is opened by turning in clockwise direction and closed in reverse order (see marking on the cover). Reservoir cover must be closed while working. We recommend using clean water for filling.
When filling the reservoir, never insert the hose through cover into the reservoir or allow contact between spray and filling hose, as pollution of supply part of the hose may arise. Due to pressure fall, spray can flow back to filling hose.

Figure 7.1

7.2 RESERVOIR FOR RINSING

The reservoir for rinsing is intended for washing of the reservoir and other elements after you have finished working or after a break. Fill the reservoir with clean water. You can find more detailed instructions in the chapter "DESCRIPTION OF SETTINGS OF VALVES FOR SPRAYING OR CLEANING".

7.3 RESERVOIR FOR WASHING HANDS

This reservoir is intended for washing hands after handling insecticides. Fill the reservoir with drinkable water. Its capacity is 15 litres.

	WARNING: Water is not drinkable!

7.4 MIXING NOZZLE

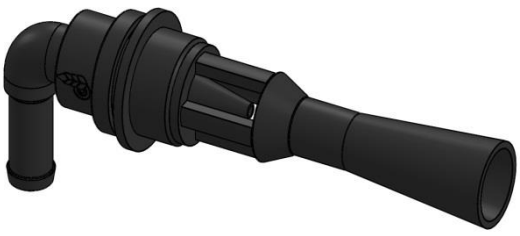


Figure 7.2

The sprayer is equipped with mixing nozzle for better mixing, which is installed in the bottom part of the reservoir. The mixing nozzle is controlled by means of the valve which is mounted on the pressure regulator. The mixing nozzle is operating when the lever of the valve is in upright position and vice-versa. It is recommended to turn on the mixing nozzle during insecticide preparation and driving to the field.

7.5 SUCTION FILTER

The suction filter is mounted between the reservoir and the pump. Its function is filtrating the insecticide before it reaches the regulator. The size of the filter is 50 MESH.

7.5.1 CLEANING FILTER INSERT

Firstly, unscrew the yellow lever (3) on the filter cover (2) by turning it counter clockwise and pulling it out. The valve mounted inside the filter will close the flow of the liquid from the main reservoir. Unscrew the nut (5) from the filter cover and remove the cover and the filter insert (4). Clean the filter insert and mount all parts back together in the reverse order.
When mounting the parts back together, make sure that the metal pin of the locking valve, which is located at the extracted part (with a yellow lever) will be properly inserted, otherwise the filter will not function properly.

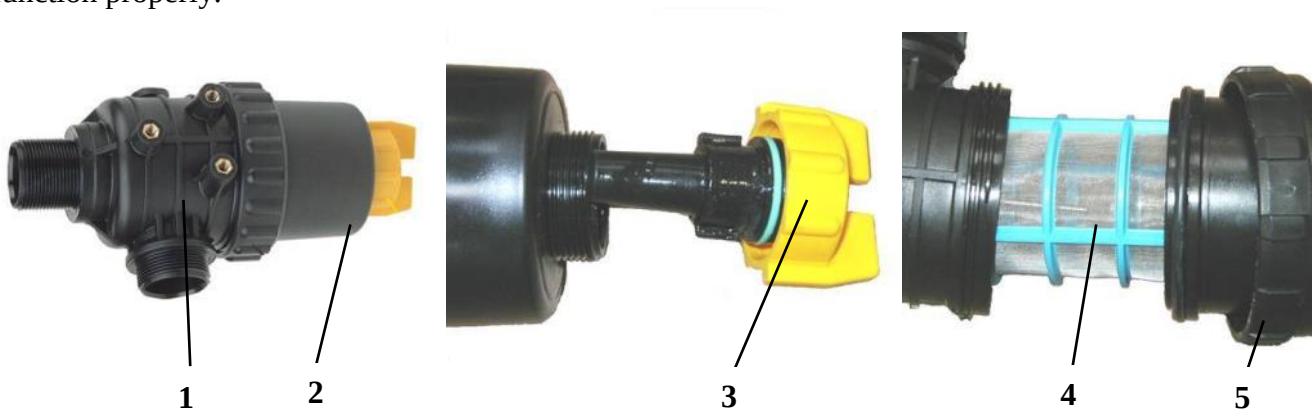


Figure 7.3

	WARNING: Use protective gloves when cleaning the filter! **Clean the filter insert before each filling of the reservoir!**

7.6 NOZZLE FOR CLEANING INTERIOR OF MAIN RESERVOIR

Nozzle is mounted in the interior of main reservoir and is intended for washing of reservoir's interior after finished spraying. It is connected to one of the supply valves on pressure regulator, which, when open, provides required water for cleaning.

Figure 7.4

	WARNING: Nozzle shape in the figure is illustrative only and can differ from actual state on the sprayer.

7.7 FILLING CONTAINER

Filling container is intended for mixing and pumping of spray into the main reservoir. It is mounted at the side of the main reservoir and lowered a little. Filling container consists of: frame with reservoir (21), control valves (20), mounted on the frame, injector nozzle for mixing (14), rinsing nozzle of reservoir (16), valve with nozzle for rinsing packaging (19) and additional diversion valve on pressure regulator (6).

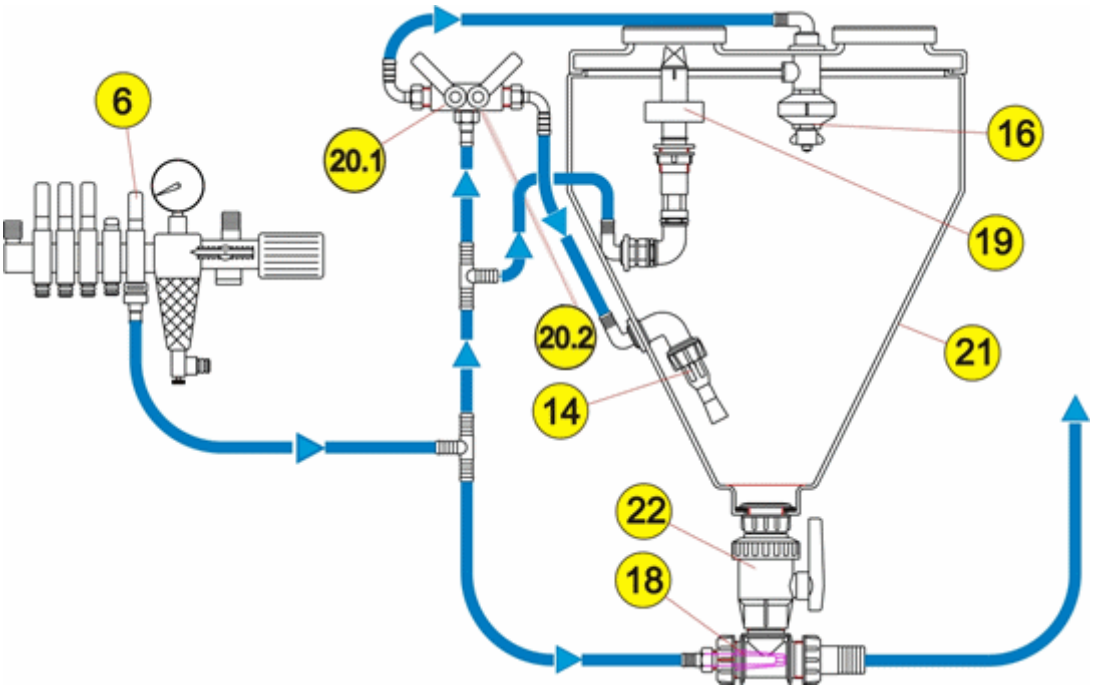


Figure 7.5

7.7.1 FILLING CONTAINER OPERATION

Fill the main reservoir to approximately 1/3 with water, turn on the pump and open the main valve on flow regulator. Check if the control valves and release valve (22) on the filling container are closed.

Open the diversion valve (6) on pressure regulator and set working pressure to **min. 5 bar.** Fill approximately 1/3 of filling container with water by opening the lever of control valve (20.2), which supplies the injector mixing nozzle (14). You can control supply by opening the lever on control valve. Put or pour the foreseen amount of spray (according to spray manufacturer's instructions) in the filling container. Rinse the packaging with nozzle for packaging rinsing (19) by opening the cover and pushing the opening on packaging on rinsing nozzle with control valve closed (20.1.). Rinsing nozzle can also penetrate protective foil under packaging cover, so there is no contamination of the environment.
Open the control valve (20.2.) with injector mixing nozzle (14) and, when the level of mixed preparation is approximately 5 cm under the top of filling container, close the control valve (20.2.). Open the release valve (22), which, with the help of injector suction nozzle (18), enables suction of mixed preparation from filling container to main reservoir.
When the container is empty, leave the control valve (20.1.) for some time to wash out the filling container. Close the control valve (20.1.), wait that it pumps the content to main reservoir and then close the release valve (22). Close the diversion valve on pressure regulator (6) and close the main valve on flow regulator.

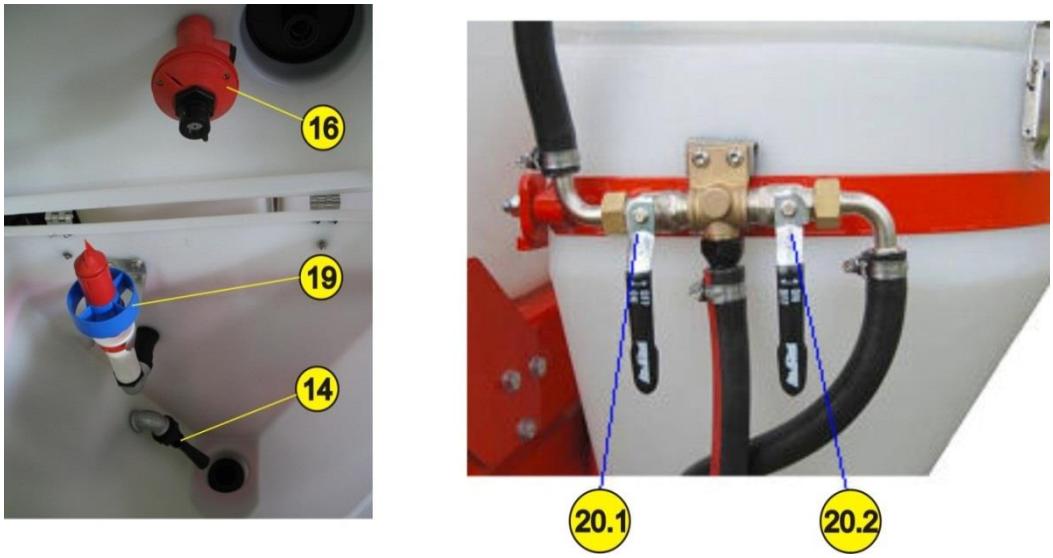


Figure 7.6

End cleaning of filling container interior is done after spraying, when cleaning the entire sprayer. Use rinsing nozzle of reservoir (16), which is activated by opening the diversion valve (6) on pressure regulator and control valve (20.1.) on filling container.

	WARNING: Use protective equipment when cleaning!

7.8 VALVE FOR WASHING PACKAGING

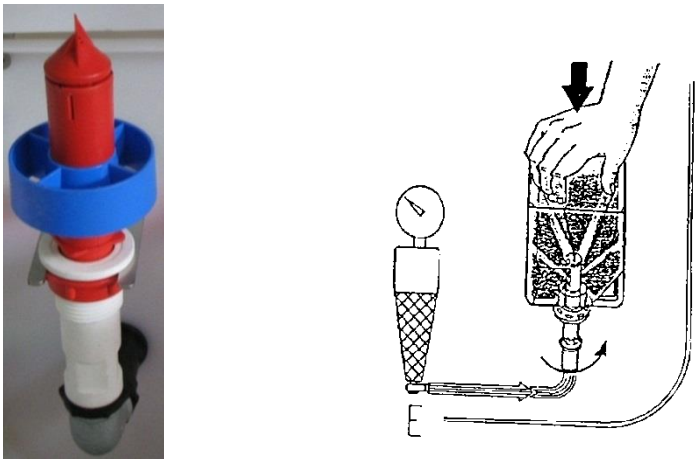


Figure 7.7

Valve is intended for washing packaging of liquid chemical protection products. It is installed in the filling container and connected to diversion valve on pressure regulator through hoses. When you want to wash packaging, open it, push it over the nozzle to limiter and press it down, together with limiter. This opens the valve and activates rotating nozzle, which thoroughly cleans the packaging. When packaging is removed, valve closes flow of liquid. Rinsing nozzle can also penetrate protective foil under packaging cover, so there is no contamination of the environment.

	WARNING: When working with sprays, use protective equipment!

7.9 DESCRIPTION OF SETTING OF VALVES FOR SPRAYING OR CLEANING

7.9.1 SPRAYING

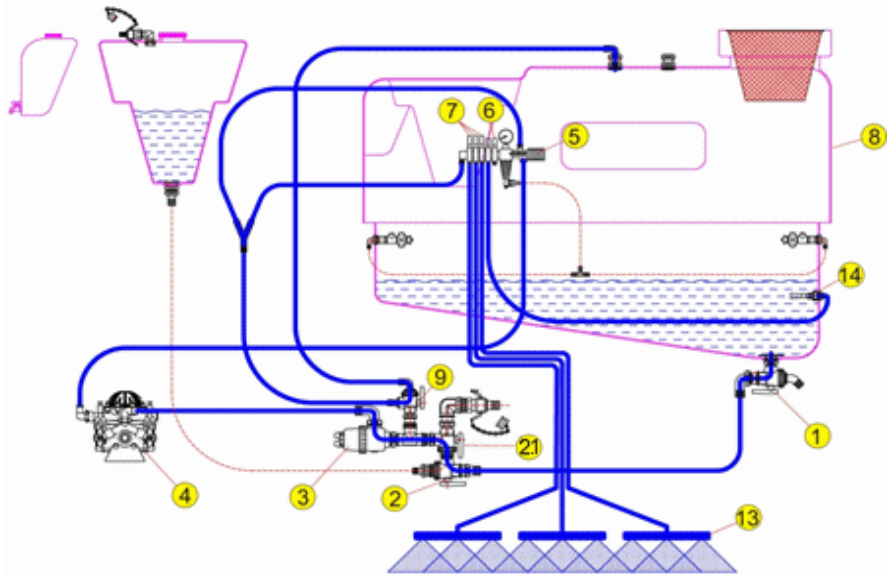


Figure 7.8

Empty spray from the main reservoir (8) by opening three-way valves (1, 2 and 2.1) through filter (3) and pump (4) in pressure regulator (5). Open valve for mixing of spray (6) and for individual nozzle sections (7). Flow direction of three-way vale is shown on the valve lever with an "arrow" and figure of function scheme of valves. Set the selection valve (9) so that the liquid excess from regulator is directed to main reservoir.
A detailed description of regulators is given in chapter 9 "Pressure regulator".

7.9.2 COMPLETE CLEANING OF SPRAYER

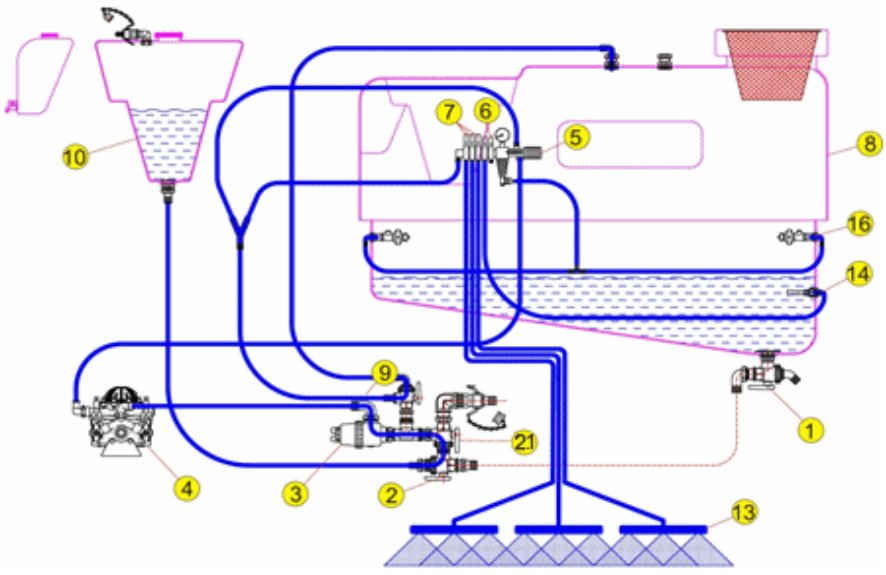


Figure 7.9

Complete cleaning of the sprayer includes the cleaning of all inner parts of the sprayer: the reservoir (8), the filter (3), the pump (4), the regulator (5), the nozzles (13). Switch the three-way valve (2) to the rinsing reservoir (10). Direct the clean water from the reservoir (10) through the pump (4) into the pressure regulator (5). By opening the valves (6 and 7) you enable water to flow to the nozzles and to the mixing nozzle (14). The flow from the pressure regulator through the selection valve (9) should be directed into the main reservoir. At the end of the process, switch the three-way valve (2) to the main position and empty the reservoir through the nozzles (13).

7.9.3 PARTIAL CLEANING OF SPRAYER

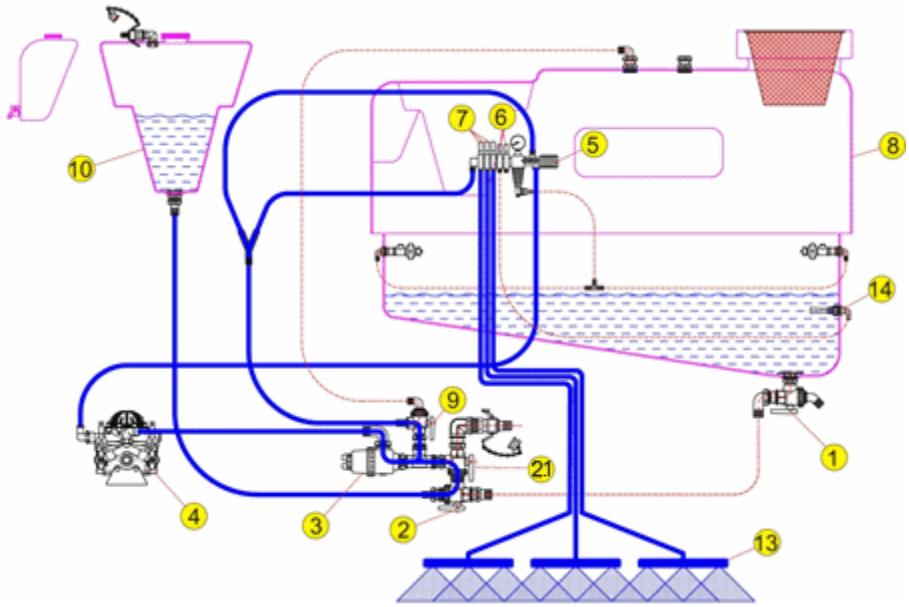


Figure 7.10

Partial cleaning of the sprayer includes the cleaning of the filter (3), the pump (4), the pressure regulator (5) and the nozzles (13) without changing the concentration of the insecticide in the main reservoir.

Switch the three-way valve (2) to the rinsing reservoir (10) and change the flow directly to the pump (4) by means of the selection valve (9). Close the mixing valve (6) by means of the pressure regulator (5) and, if needed, the return line from the pressure filter, too. The clean water can now easily flow through the filter (3), the pump (4), the pressure regulator (5) and through nozzles (13) whereas the concentration of the insecticide in the main reservoir remains the same.

7.10 EXTERIOR FILLING OF RESERVOIRS

For easier and more convenient filling of reservoirs with water, the sprayer is equipped with special bayonet connection (23, 24), which make filling safe and clean.

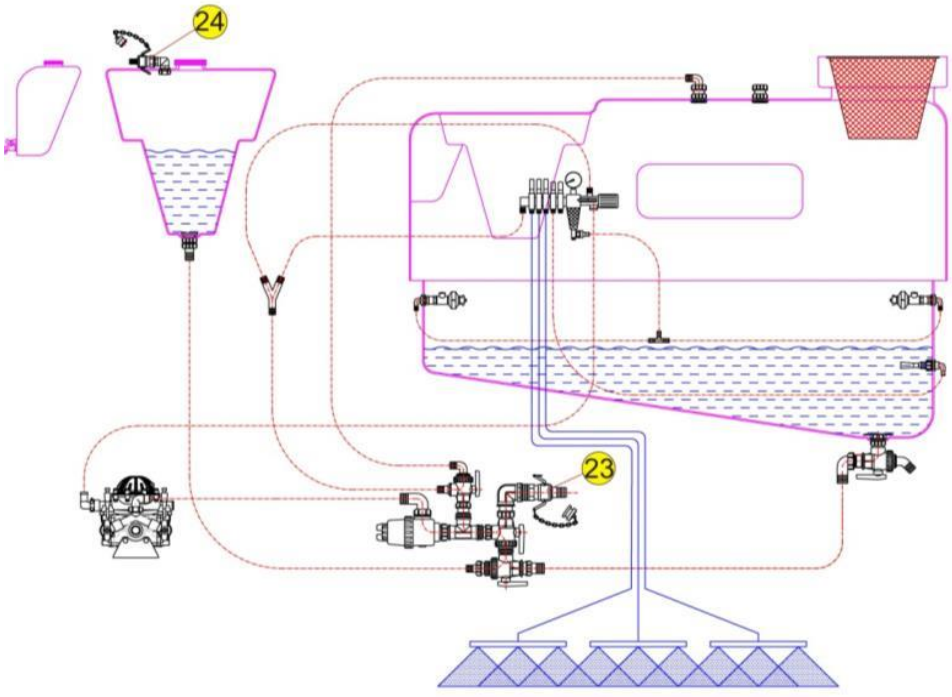


Figure 7.11

7.10.1 FILLING MAIN RESERVOIR

⇒ FILLING (SUCTION) THROUGH PUMP

Both types of sprayers have the connection for exterior filling of main reservoir integrated into the system of regulation valves under the main reservoir (23). (figure 7.11)

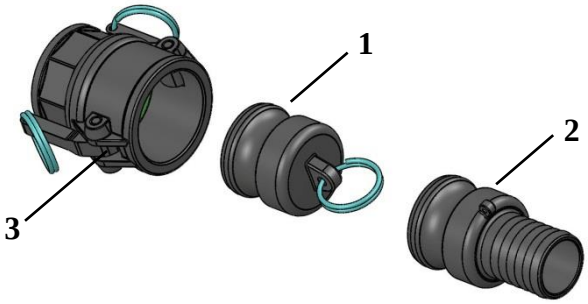


Figure 7.12

1. Stop valve
2. Fitting
3. Connection

Figure 7.13

PROCEDURE OF WATER SUCTION INTO MAIN RESERVOIR

Function of filling is done by suction of water through pump into the reservoir. Remove the stop valve (1), fit the suction hose to fitting (2) and secure it with hose clamp. Connect the fitting (2) with hose to connection (3) and secure it with side levers.

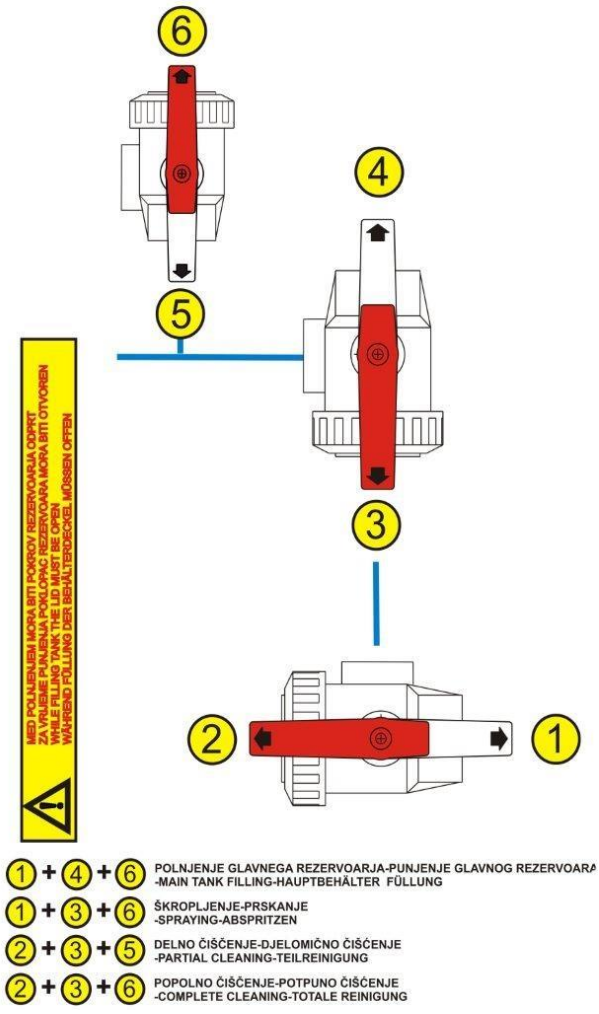

6
4
5
3
2
1
MED POLNJENJEM MORA BITI POKROV REZERVOARJA ODPRT
ZA VRIJEME PUNJENJA POKLOPAC REZERVOARA MORA BITI OTVOREN
WHILE FILLING THE TANK LID MUST BE OPEN
WÄHREND FÜLLUNG DER BEHÄLTERDECKEL MÜSSEN OFFEN
1 + 4 + 6 POLNJENJE GLAVNEGA REZERVOARJA-PUNJENJE GLAVNOG REZERVOARA
-MAIN TANK FILLING-HAUPTBEHÄLTER FÜLLUNG
1 + 3 + 6 ŠKROPLJENJE-PRSKANJE
-SPRAYING-ABSPRITZEN
2 + 3 + 5 DELNO ČIŠČENJE-DJELOMIČNO ČIŠĆENJE
-PARTIAL CLEANING-TEILREINIGUNG
2 + 3 + 6 POPOLNO ČIŠČENJE-POTPUNO ČIŠĆENJE
-COMPLETE CLEANING-TOTALE REINIGUNG

Figure 7.14

- Set the lever of selection valve to position 1.
- Open the lever of valve for exterior supply to position 4 (FILLING MAIN RESERVOIR).
- Set the lever of selection valve to position 6.
- After filling the reservoir, move the lever of valve for exterior supply back to position 3 and disconnect the fitting with hose.

	WARNING: Gather water only from a pool or a water reservoir, never from a hydrant under pressure, because damage to the pump can occur!

⇒ FILLING THROUGH HYDRANT (ADDITIONAL EQUIPMENT)

The sprayer can also be, optionally, equipped with system for exterior filling of main reservoir through a hydrant. Filling of main reservoir has additional protection of anti-reversing valve (4), which prevents flow of spray from the reservoir. Float valve mechanism, installed at the top on the cover, enables flow of air out of the reservoir, so it is not required to open the whole cover. Hose Ø 40 mm (1) is fitted to fitting (2) and secured with hose clamp. Fitting (2) with hose is connected to connection (3) and secured with side levers. Filling capacity is max. 250 l/min.

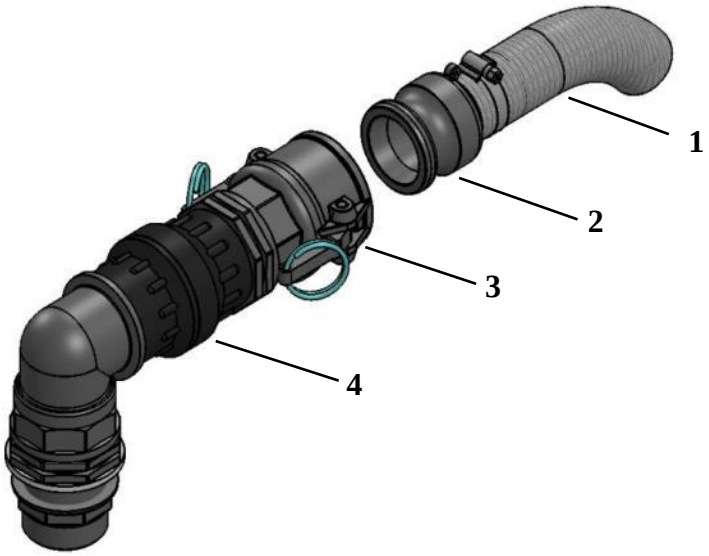


Figure 7.15

7.10.2 FILLING ADDITIONAL RESERVOIR FOR CLEAN WATER

Sprayers of this type are equipped with bayonet connection for filling of additional reservoir (24), installed directly on this reservoir (figure 7.11). Before filling of additional reservoir, the cover on the top must be opened, so that air can escape.
When filling additional reservoir, insert fitting with hose Ø 19 mm in connection and secure it with side levers. After finished filling, disconnect it in reverse order.

Figure 7.16

7.11 LIGHT SIGNALIZATION

Light signalization is installed on the back of the spraying equipment. It is equipped with reflective boards (RED-WHITE), back lights with reflective triangle and two white reflectors, mounted on the front part of equipment. Connection cable with plug is led to tractor cabin. Light signalization elements are displayed in the figure below.

Figure 7.17

Figure 7.18

8 ADDITIONAL EQUIPMENT

8.1 SET FOR EXTERIOR WASHING OF SPRAYING DEVICE

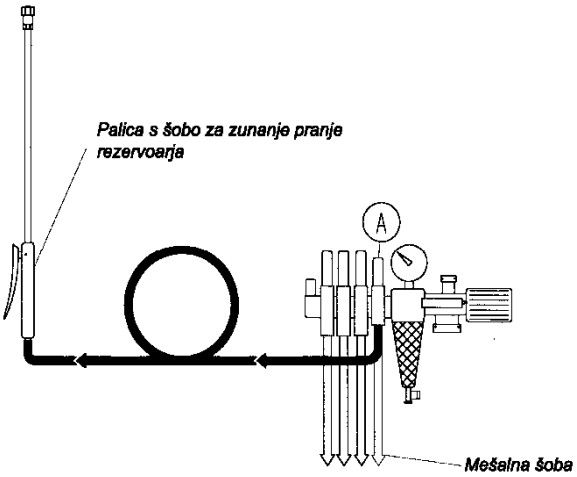


Figure 8.1

After finished working the spraying appliance needs to be cleaned. The most appropriate place for cleaning is at the edge of the surface where you have had just finished operating the machine. For this purpose, a set for outer cleaning of the spraying appliance is a big help.
The set includes:

- a spraying stick
- a flexible hose and
- a fitting for connecting the spraying stick to the pressure regulator

The fitting needs to be mounted on a free valve of the pressure regulator (if a free section is mounted on pressure regulator) or a section on the pressure regulator needs to be disconnected (mixing nozzle) and connect the spraying stick to the spraying device.
Other parts of the spraying device need to be set the same as for partial cleaning of the sprayer (see chapter "PARTIAL CLEANING OF SPRAYER").

8.2 SUCTION BASKET WITH SUCTION HOSE

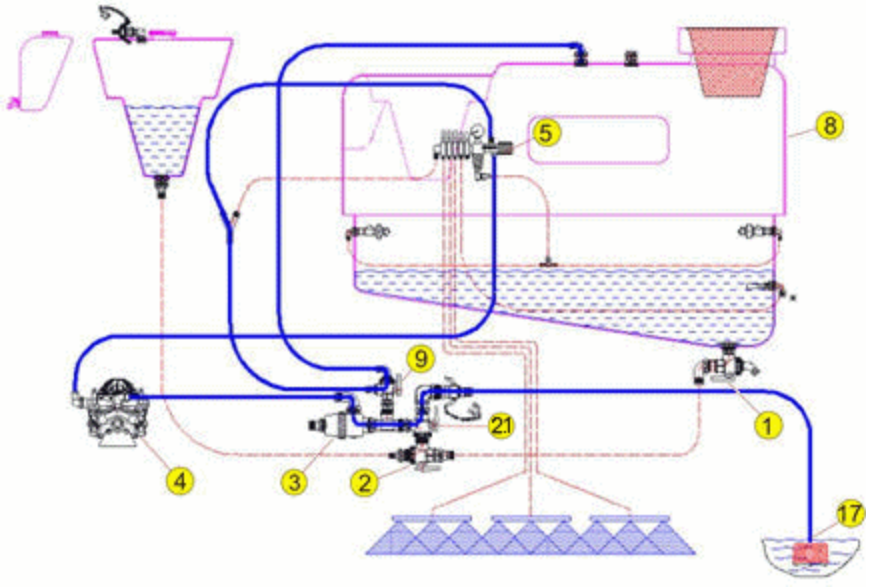


Figure 8.2

Legend:
1. Three-way selection valve with release
2. Three-way selection valve
2.1 Three-way valve for switch to suction
3. Suction filter
4. Pump
5. Pressure regulator
8. Main reservoir
9. Selection valve
17. Suction basket with suction hose

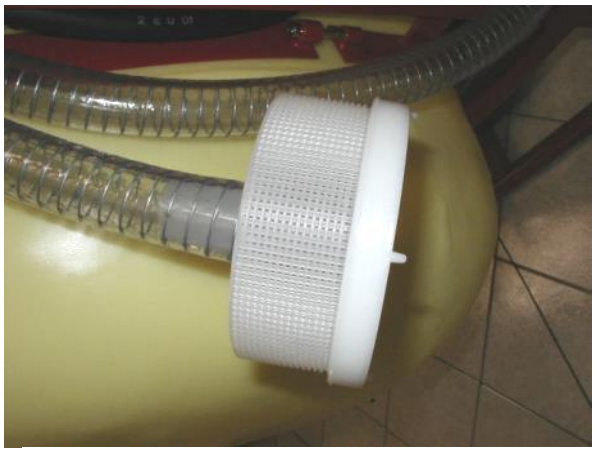


Figure 8.3

Figure 8.4

The suction basket is meant for sucking of water out of ponds, streams, fountains, etc. through the filter, the pump and the regulator into the main reservoir. It consists of the suction basket, 5 meters of suction hose and an end fitting. The fitting is mounted to bayonet connection under the main reservoir (see chapter "FILLING MAIN RESERVOIR"). Stretch the suction hose and plunge the suction basket into water. While doing this, be aware that suction height (height difference between water level and pump) has great effect on load on the membranes in the pump. The height difference between the pump and the suction point should not be bigger than 3 metres. Before turning on the pump, switch the lever for exterior supply to position 4 (see chapter "WATER SUCTION PROCEDURE IN MAIN RESERVOIR") and close the three-way valve at the exit of the reservoir (outflow of the reservoir). The water flow is now directed from the suction basket to the suction filter, the suction pump and the flow regulator (return line) into the reservoir.

	WARNING: Be very careful when sucking water out of a pond, since a small inattention can poison the water in it!

8.3 MARKER

Marker is part of additional equipment of sprayers, used for marking borders of previous surface with foam.
The foam is created with a proper mixing of air with a mixture of water and liquid detergent. The appliance makes white foamy points (diameter 10-20 cm) every 5-20 seconds (depending of the setting) and by this it creates a line, which marks the border of previously sprayed surface.

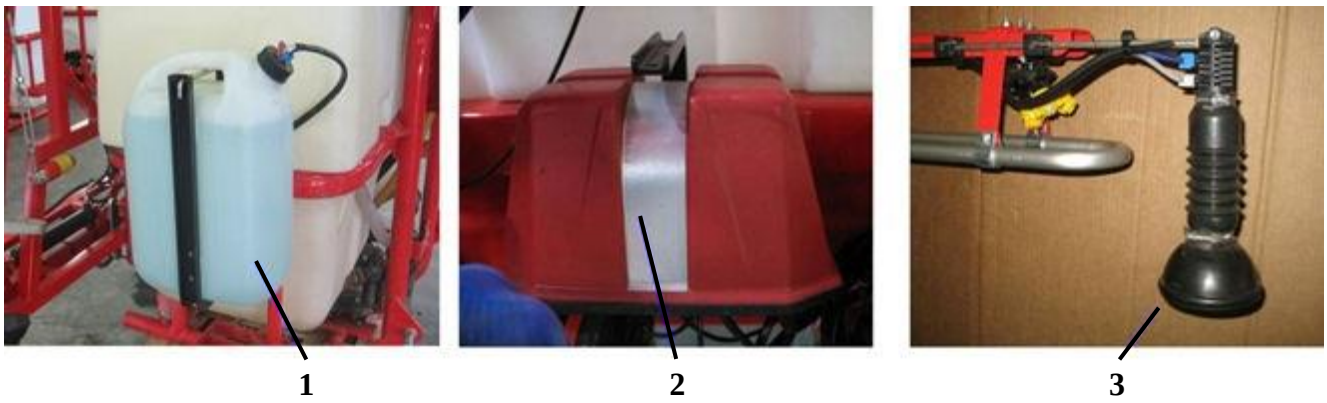


Figure 8.5

8.3.1 MOUNTING

Mount the reservoir for liquid detergent (1) to the side of the reservoir, the compressor block (2) to the rear side of the sprayer between the guides of the spraying equipment. The mixing nozzles (3) of the marker must be attached to the end of the spraying equipment and the control box in the cabin of the tractor. The connecting hoses must be guided along the spraying hoses of the spraying equipment and connected to the ties, but make sure the hoses will not be overstretched, as that could damage them. The hoses must allow you to normally handle the spraying equipment.

8.3.2 INSTRUCTIONS FOR USE

Since the marker is not a part of the sprayer’s standard equipment, you can find detailed instructions for use in a separate booklet "MARKER – INSTRUCTIONS FOR USE AND MAINTENANCE".

8.4 SATELLITE NAVIGATION (GPS)

Satellite navigation (figure 8.6) in connection with pressure regulator AG-Tronik enables drawing out parcels and even application of spray agents with minimum overlapping between section, when spraying on previously drawn parcel (figure 8.7).

Figure 8.6

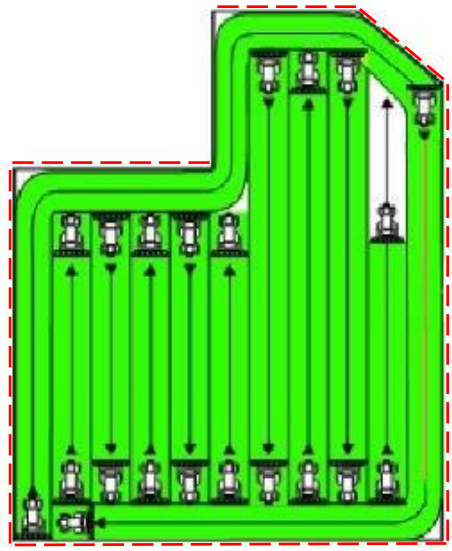


Figure 8.7

Good quality of the device is that it detects:

- intermediate paths, where you have already sprayed
- driving outside of marked parcel
- arrival at final destination

When all sections cover the sprayed area, navigation sends AG-Tronik a signal to close the main valve. AG-Tronik automatically closes the valve through pressure regulator and abort of spraying is shown on navigation screen (figure 8.8).
If there is partial overlapping, navigation detects this and forwards this to AG-Tronik, which closes only those sections, which cover already sprayed surface, while other sections remain in spraying phase (figure 8.9).

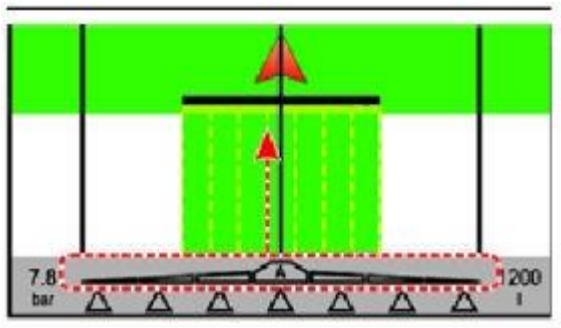


Figure 8.8

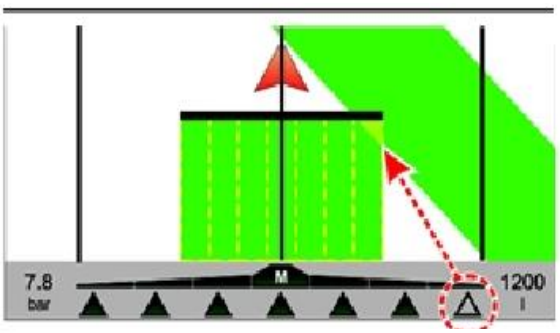


Figure 8.9

When spraying surfaces do not overlap anymore, navigation sends AG-Tronik a signal to open the main valve again. Restart of spraying is displayed on the screen.

Detailed instruction for use are supplied with satellite navigation, if the sprayer is fitted with this system.

9 PRESSURE REGULATOR

9.1 PRESSURE REGULATOR PR3 ECF (RC4)

Flow regulator PR3 ECF is intended for remote regulation of spraying parameters in all lines, of carried and towed sprayers, for working pressure from 0 to maximum 12 bar. There are two types of pressure regulators PR3 ECF with remote regulation RC4. The difference is in diversion regulation valves.

Figure 9.1

Regulator version with diversion regulation valves, EC marking (figure 9.1, see position 4), without reverse choke valve (see chapter "DIVERSION REGULATION VALVE EC").

Regulator PR3 ECF type 1 is consisted of:

1. Central-regulation part
2. Self-cleaning pressure filter
3. Diversion valve (manual)
4. Diversion regulation valve EC (ARAG)
5. Manometer

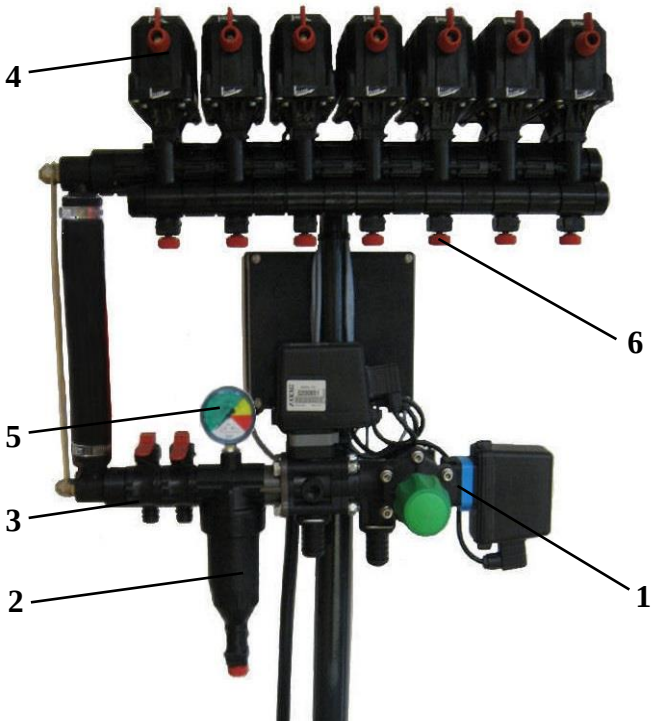


Figure 9.2

Regulator version with diversion regulation valves, EC marking (figure 9.1, see position 4), without reverse choke valve (see chapter "DIVERSION REGULATION VALVE EC" and chapter "REGULATOR SETTINGS FOR WORK").

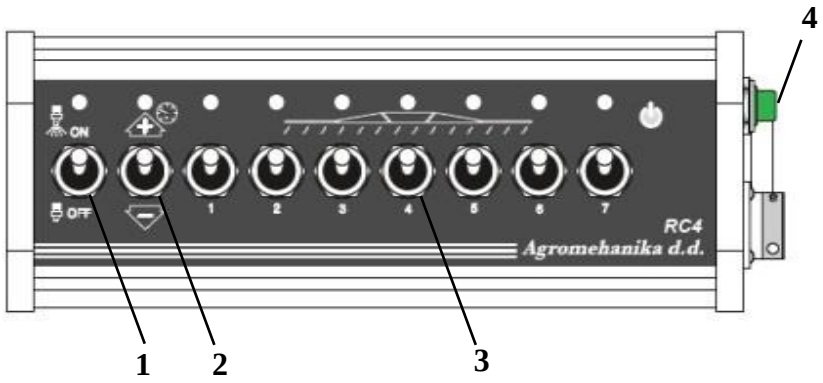
Regulator PR3 ECF type 2 is consisted of:

1. Central-regulation part
2. Self-cleaning pressure filter
3. Diversion valve (manual)
4. Diversion regulation valve EC
5. Manometer
6. Choke valve

9.1.1 CONTROL PANEL RC4

Control of all regulator functions id done with control panel RC3, which control electric motors in individual valves or spraying sections.

In version PR3 ECF, two models of regulators are used, depending on the size of spraying equipment. The difference between them is in the number of diversion regulation valves (with spraying equipment 18, 21, 24 m-H there are 7 diversion valves on the regulator, with spraying equipment 12, 15, 16, 18MY there are 5 diversion valves on the regulator).
Sprayer type AGS 1000 EN-H and AGS 1200 EN-H has an in-built regulator with 5 diversion regulation valves, which means that sections 1 and 7 on the panel of remote regulation are **free.**



1. Turn main valve ON/OFF
2. Pressure regulation
3. Section on/off
4. Remote regulation on/off

Figure 9.3

⇒ CONNECTION

ELECTRICAL CABLE OF CONTROL PANEL

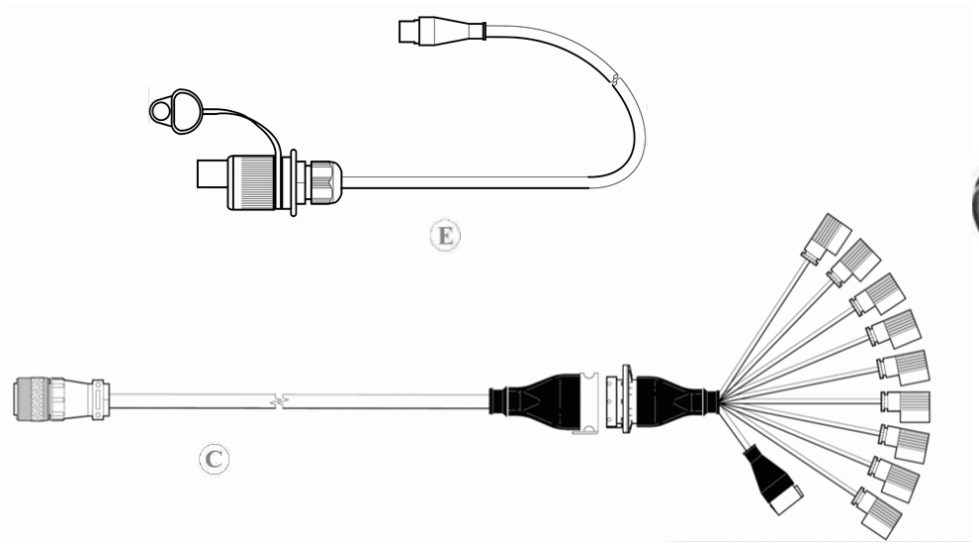


Figure 9.5

Figure 9.4

E Supply cable + supply plug
C Connection cable between control panel and solenoid hydraulic valves

Technical and operational characteristics:

Description	Value
Supply voltage	12 V DC
Working area	0 °C – 70 °C
Fuse	10 A

9.1.2 REGULATOR MARKING

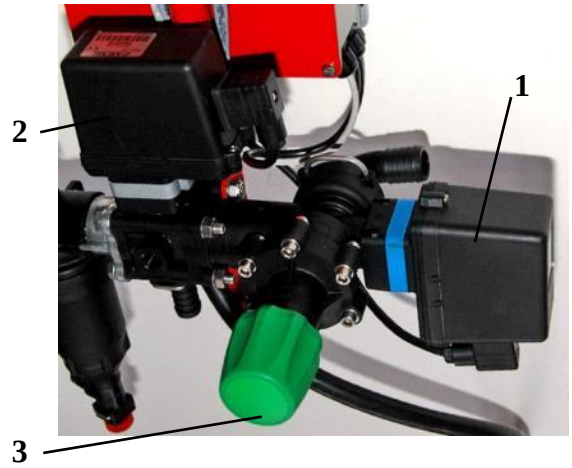
Basic marking of regulator is PR 3EC. Basic marking has an added:

- Marking F, meaning that the regulator is fitted with self-cleaning filter.
- Marking M, meaning that the regulator is fitted with flow-meter.
- Marking 5EC, denoting 5 electric motor diversion regulation valves.
- Last number 2, meaning that the regulator is fitted with two manual diversion valves.

Example:
Marking PR3 ECF /5EC+2
It is a regulator PR3 ECF with self-cleaning pressure filter, five diversion regulation valves and two diversion valves.

9.1.3 CENTRAL REGULATION VALVE

Central regulation valve regulates central opening and closing of the entire system. Manual regulation valve is used to set max. working pressure and fine adjustment with electric motor regulation valve. Main valve is controlled with button ON/OFF, and electric motor valve with button for pressure increase/decrease on remote regulation.

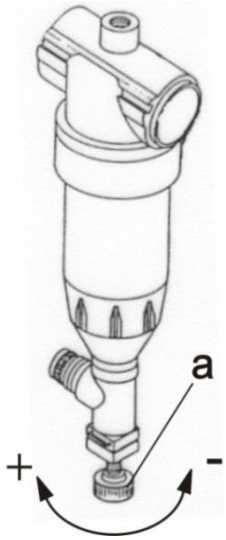


Central regulation system is consisted of three main component parts:

1. Main valve
2. Regulation electric motor valve
3. Manual regulation safety valve

Figure 9.6

9.1.4 SELF-CLEANING FILTER



The self-cleaning pressure filter additionally cleans the insecticide before this is sprayed through the nozzles. Small parts that get caught in the filter insert (density M 50) are sent back to the reservoir through the valve mounted at the bottom of the filter (a) when cleaning the filter insert. During operation the filter must remain closed.
However, when using pumps with larger flows, you can disburden the regulator by opening the valve (a) on the filter bottom, but you must be careful as it could happen that you won't be able to achieve the required spraying pressure. In such an event you must close the valve or at least turn it down to such an extent, that pressure in the system will rise to the required limit.
Periodical cleaning of the filter is performed by opening the valve (a), so a part of the flow is redirected back to the reservoir.
A thorough cleaning of the filter must be performed after spraying.

Figure 9.7

	WARNING: Since an opened valve can cause huge pressure drops when using less powerful pumps or nozzles with a higher flow, it is recommended to close the valve in such a case.

9.1.5 DIVERSION REGULATION VALVE EC

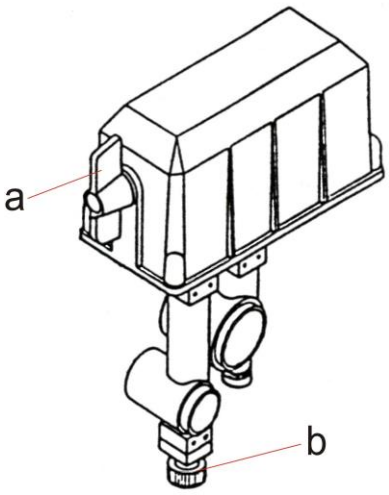


Figure 9.8

Diversion regulation valve EC uses two in-built electric motors to open and close flow to individual parts of spraying equipment. In-built reverse choke valve enables preservation of constant pressure, independent of number of open valve. Correctly set reverse choke valve, with closed flow to nozzles, returns the same amount of spray to reservoir, as it is used by nozzles in the section (fine adjustment).

a – lever for manual opening of valve
b – button for setting reverse choke valve

9.1.6 DIVERSION REGULATION VALVE EC (ARAG)

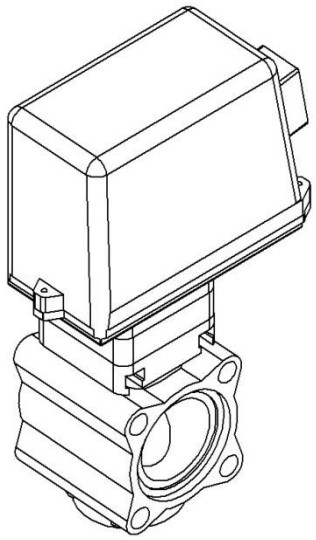


Figure 9.9

Diversion valve EC (ARAG) with in-built electric motors enables opening and closing of flow to individual sections of spraying equipment (On/off valve).

9.1.7 DIVERSION VALVE (MANUAL)

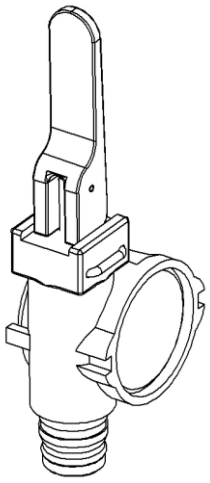


Figure 9.10

Diversion valves are used for opening and closing of individual sections on spraying equipment with smaller working widths and for opening and closing of the system, which provides smooth mixing in main reservoir.
They can also be used as valves for supplying structures, which are part of sprayer additional equipment.
All versions of pressure regulators type PR3 are fitted with them.

Valve is open, when the lever is in position, displayed in the figure.

9.1.8 SETTING DIVERSION REGULATION VALVES (FINE ADJUSTMENT)

Setting is possible only if optional diversion regulation valves type EC (figure 9.8) are fitted on regulator PR3 ECF (RC4).

Regulator setting is done with clean water before spraying. First, with wanted hectare consumption, we calculate appropriate working speed and working pressure for fitted nozzles. Then we set working revolution of tractor engine according to calculated working speed and open all diversion regulation valves. We close all choke valves and use switch for regulation of working pressure to set chosen working pressure.
After setting working pressure, we begin setting reverse choke valves on diversion regulation valves EC.
When we close one diversion regulation valve EC, working pressure changes slightly (increases). By turning regulation nut of reverse choke valve we reset working pressure to the one set before. We repeat this setting procedure for each diversion regulation valve.
Correct setting ensures constant working pressure, regardless of number of opened diversion regulation valves. In case of replacing nozzle with nozzles with greater or smaller flow, or due to significant change in working pressure, setting must be done again.

9.2 PRESSURE REGULATOR PR3 ECFM (AG-TRONIK)

Optional pressure regulator PR3 ECFM, controlled by AG-TRONIK, enables, in connection with pressure flow-meter and speed gauge, to monitor and automatically balance hectare dosage.
If using regulator with AG-Tronik, you must ensure that all diversion regulation valves are **closed!** (see chapter "DIVERSION REGULATION VALVE EC").

	WARNING: When using open diversion regulation valves EC, inappropriate hectare dosage or spray use can occur!

Along with AG-Tronik, also GPS navigation can be used as additional equipment, which automatically closes sections, which enables the best efficiency of coverage in spraying of a surface (see chapter "SATELLITE NAVIGATION – GPS").

Figure 9.11

Instructions for use with catalogue of spare parts are a separate booklet (ELECTRONIC REGULATION) and enclosed to machines, fitted with this system.

9.3 PRESSURE REGULATOR MAINTENANCE

After every single spraying the regulator needs to be washed with clean water. This is done by letting clean water flow through the regulator (see chapter "COMPLETE CLEANING OF SPRAYER"). The remains of spray (arise after evaporation of water) cause damage to vital parts (additional corrosion of seals) of regulator or can come off the walls in future spraying and clog mouthpieces of nozzles.
The easiest way of cleaning the filter is to open the valve on bottom side, close all of the diversion valves and enable full flow through the filter. Clean the filter insert by hand from time to time and replace it if it is worn or damaged. To do this, turn the lower part of the filter (E 14022/1) in counter clockwise direction, pull out the filter insert (E 14021) and clean the inside of it with a brush and flowing water. Before reassembling the filter also clean the seal and its place and grease the seal. This applies to all junctions where round seals are used.
Use oil or WD-40 to grease all of the moving parts and threads of the regulator every 40 working hours. Thoroughly clean and grease the "0" seals before connecting the connecting parts together. When assembling the parts, slightly turn the attachment in order not to damage the seal.
Empty the reservoir during winter.

In winter, pump must be completely emptied of water or the pump must be protected from freezing (see chapter "MAINTENANCE AND STORAGE AFTER SEASON – PRESSURE REGULATOR").

	WARNING: Use protective equipment when cleaning!

10 PUMPS

Pumps are a vital element of spraying appliances. The reliability and a long durability of the pump also depend on how you treat the pump and whether you use and maintain it correctly.
IMPORTANT: The standard version of all pumps is equipped with membranes which are made of NBR rubber. Therefore it is the user's duty to use only chemical agents for spraying which do not harm this kind of material. On the opposite, the manufacturer cannot be held responsible for any kind of damage that could occur.

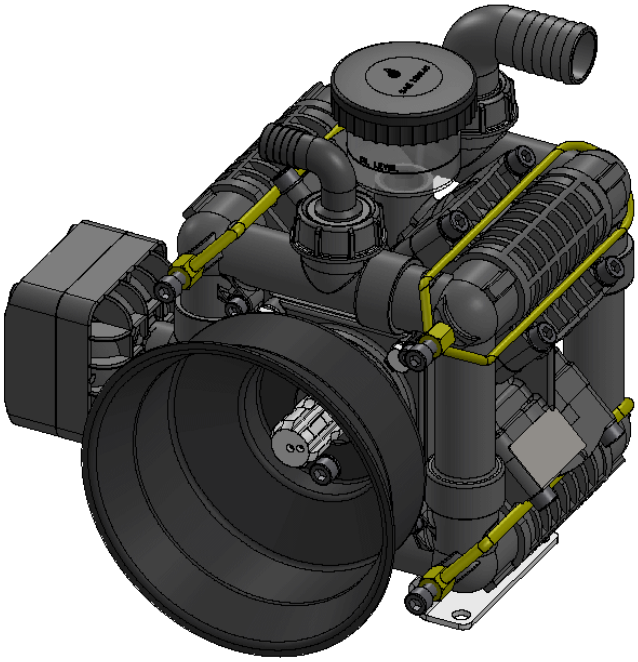
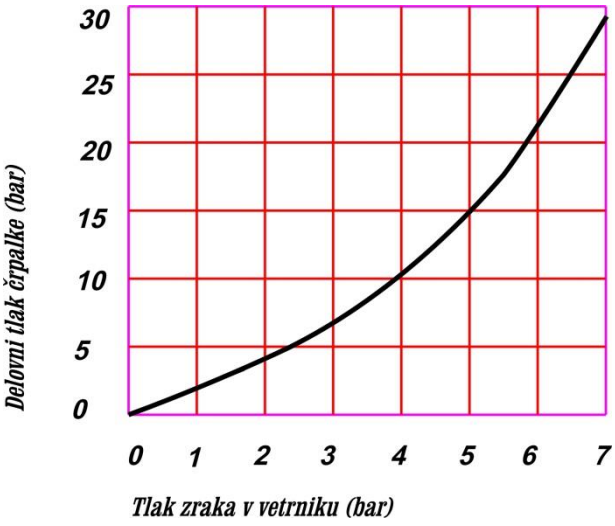


Figure 10.1

10.1 CONTROL BEFORE USE

When the pump is not operating, check the oil quantity in the housing of the pump. Also check the oil level every single time before filling the reservoir. The level must be within the limits which are marked on the oil lid or in the oil pot (depends on the version of the pump). If the oil level is too low add some oil whereas be careful not to exceed the maximum allowed level.
The air pressure in the air chamber depends on the working pressure which can be found in the diagram on the left. The air pressure in the air chamber must never be higher than the working pressure of the pump.



Make sure that the valves ensure free flow of liquid from the reservoir to the pump. Also check the porosity of the suction filter insert and the suction hose (make sure that the hose is not folded).

10.2 USE

Before turning on the pump, make sure that the main valve on pressure regulator is closed (return to reservoir.
Never turn on the pump's drive when the setting on the regulator enables full load on the pump.
Turn on the pump and let it run for approximately one minute under minimum pressure in order to aerate the pump and the inlet and the outlet pipes. Only then can you put full load on the pump.
Be careful not to exceed the maximum allowed pressure and the maximum allowed rpm of 540. On the opposite, the manufacturer cannot be held responsible for any kind of damage that could occur.

10.3 AFTER USE

Some chemical agents can shorten the durability of some vital parts of the pump such as rubber membranes and other rubber seals. Therefore a thorough washing of the pump after each single spraying is recommended. To do this, you will need to pump some clean water through the pump. Let the pump operate at working pressure for several minutes. Lower the pressure and let the pump operate for approximately one minute to blow out the rest of the liquid.
During winter, leave all of the water out of the pump and/or protect the pump against freezing (see chapter "MAINTENANCE AND STORAGE AFTER SEASON").

10.4 PISTON MEMBRANE PUMPS BM 150/20

Pumps type BM 150/20 are low-pressure piston membrane pumps, made of materials that have been tested by the factory. The pumps are suitable for pumping of insecticides or liquid fertilizers which are used in farming.

10.4.1 TECHNICAL DATA

TECHNICAL DATA	E.M.	PUMP
		BM 150/20
Nominal flow	l/min.	146
Flow at max. working pressure and max. allowable revolutions	l/min.	136.9
Required drive power	kW	5.50
Max. allowable working pressure	bar	20
Max. allowable revolutions on pump shaft	n/min.	540
Number of pressure membranes	n	4
Oil for lubrication: up to including 2012		SAE 15W30
from 2012 on		SAE 15W40
Oil quantity	l	1,20
Weight	kg	24.00

OPERATION	INTERVAL CHECKS			
	Every 8 h	**Every 50 h**	**Every 300 h**	**1x per season**
Oil level check	**X**			
Air chamber check		**X**		
Check of the pump attachment to the frame		**X**		
Membrane check and replacement, if necessary			**X**	
Oil change			**X**	
Valve check			**X**	
Screw joints check				**X**

10.4.2 OIL CHANGE

Change the oil for the first time after the first 10-20 working hours and after that every 300 working hours. Also check the membranes when changing the oil. Replace damaged or worn membranes with new ones. It is recommended to change the membranes every 300 working hours.

WARNING: All depositing in nature is illegal, therefore, oil must be collected in appropriate containers at appropriate collection centres!

10.4.3 MEMBRANE CONTROL FOR PUMP 150/20

To check the membranes, first of all unscrew the bolts (540015) on the covers of the pump (017.41.007) and release the suction and pressure collector. After that, unscrew the bolts (019.31.317) on the covers (017.41.007) and remove the chambers.
Carefully inspect the upper and lower side of the membranes. Release the oil at the same time.
It is recommended to clean the inside of the pump and its vital parts with diesel oil before reassembling the pump. Assemble the pump in reverse order. Be careful to correctly insert the valves (see the catalogue). After that, pour fresh oil into the pump. For pump BM 150/20, oil needs to be poured in through the oil pot 017.01.142 or 017.01.146.
While pouring oil into the pump, turn the shaft of the pump several times by hand in order to press out any excess air which is caught between the piston and the membrane. Pay attention to the oil level.
Turn on the pump for few minutes at minimum pressure. Pay attention to the functioning of the pump and add some oil if needed.

10.4.4 INSTRUCTIONS FOR DAMAGED MEMBRANE

If the oil in the oil pot of pump BM 150/20 whitens, immediately stop operating the machine and replace the damaged membranes. On the opposite, the pump can be heavily damaged. It is also possible to recognise a damaged membrane by means of the manometer, since its pressure pointer does not come to a halt.

10.4.5 MAINTENANCE

After every single use, it is recommended to wash out the inside of the pump as well as other parts of the sprayer with clean water (see chapter "DESCRIPTION OF SETTINGS OF VALVES FOR SPRAYING OR CLEANING"), and after season, the pump must be prepared for winter (see chapter "MAINTENANCE AND STORAGE AFTER SEASON – PUMP").

11 SPRAYING EQUIPMENT

Spraying equipment 15MY-H, 16MY-H and 18MY-H is hydraulically foldable spraying equipment for carried sprayers type 1000 EN-H and 1200 EN-H.
Opening and closing from the transportation position into working position and vice-versa is performed with the help of hydraulic cylinders, which enable individual opening or closing of spraying booms.
Spraying equipment 15MY-H, 16MY-H and 18MY-H enables hydraulic levelling for adjustment to terrain configuration.
All spraying equipment is factory equipped with flattened jet fissure nozzles. Distance between the nozzles is 0.5 meters.

11.1 CHARACTERISTICS OF SPRAYING EQUIPMENT 15 MY-H, 16 MY-H, 18 MY-H

- working width 15 m, 16 m and 18m,
- hydraulic control of equipment from tractor cabin,
- single-point fixing of equipment,
- hydraulic block with damping,
- hydraulic levelling,
- hydraulic lift,
- vertical damping with air cushions,
- lateral damping through polyurethane springs,
- hydraulic protection of booms from opening in working position,
- hydraulic opening and closing from transport to working position and vice-versa,
- partial closing of left or right side,
- nozzle carriers TRI-JET,
- nozzle inserts LECHLER,
- safety mechanism of side booms of spraying equipment,
- nozzle protection,
- protection from impacts with the ground.

11.2 COMPONENTS FOR CONTROLLING SPRAYING EQUIPMENT

11.2.1 CONTROL PANEL

Control panel is a component part of controlling hydraulics of spraying equipment 15MY-H, 16MY-H and 18MY-H, and must be installed in an appropriate place in the tractor cabin. It contains graphic display of all working functions, which can be performed with hydraulics.

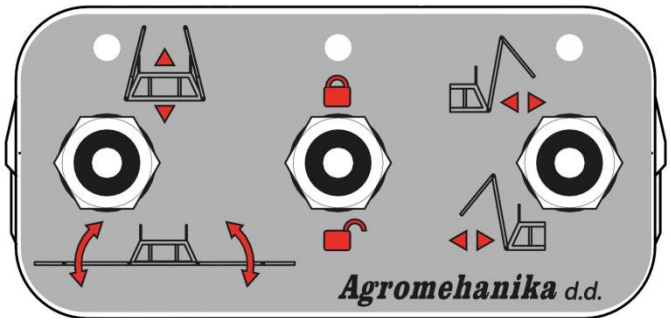
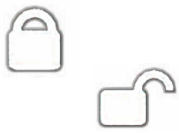
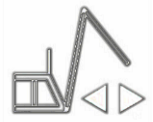
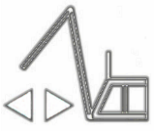


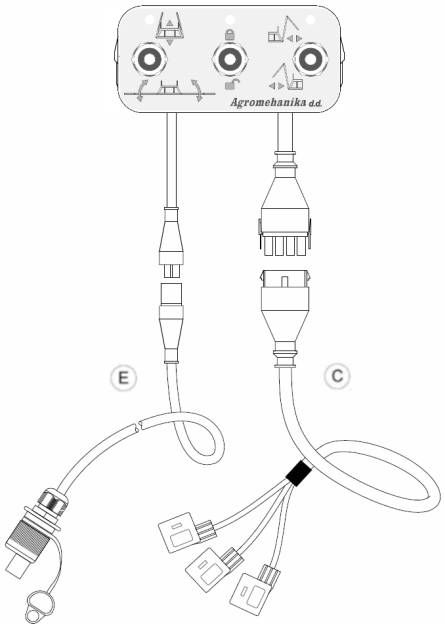
Figure 11.1

Description of functions of the control panel:

Function	***Description***
Lifting/lowering equipment	Up
	Down
Equipment levelling	Levelling – lifting right side
	Levelling – lifting left side
 **Equipment blocking**	Blocked
	Floating
 **Opening right side**	Opening right side
	Closing right side
 **Opening left side**	Opening left side
	Closing left side

11.2.2 CONNECTION OF SPRAYING EQUIPMENT TO TRACTOR

⇒ CONNECTION ELECTRIC CABLES



C Connection cable between control panel and solenoid hydraulic valves

E Supply cable + supply plug

Figure 11.2

Technical and working characteristics:

Description	Value
Supply voltage	12 V DC
Working area	0 °C – 70 °C
Fuse	10 A

⇒ CONNECTION HYDRAULIC HOSES WITH CONNECTION CLAMPS

For connection of hydraulics, tractor must be fitted with two pairs of standard hydraulic connections.

To avoid incorrect connection of hydraulic hoses of spraying equipment with tractor hydraulics and improper operation in controlling the spraying equipment, the hoses are marked with a label for correct connection:

- Yellow pair – connection to 6/2 solenoid hydraulic valve EV1 for control of lift/lowering and levelling on spraying equipment.
- Unmarked pair – connection to 6/2 solenoid hydraulic valve EV3 for control of booms on spraying equipment.

Figure 11.3

Technical and working characteristics:

Description	Value
Working pressure of safety valve	120 bar – 150 bar
Max. pressure	180 bar

	WARNING: System is not equipped with a safety valve, therefore regard the allowed working pressure!

	WARNING: Do not connect hydraulic hoses to pressure greater than allowed!

⇒ CONNECTION TO TRACTOR

Tractor cabin must be fitted with control panel for control of hydraulic cylinders on spraying equipment. It must be mounted on an appropriate fixed position. Control panel with supply cable (E) is connected to tractor source of direct electric voltage 12 V DC and maximum current 10 A. Connect the connection cable of solenoid hydraulic valves (C).

Connect hydraulic hoses with hydraulic valve of the tractor – yellow pair of hoses with hydraulic clamp separately to its line for controlling one boom (lifting/lowering of spraying equipment / levelling) and unmarked pair of hoses with hydraulic clamp separately to other line for controlling the other boom (opening and closing of left or right side of booms of spraying equipment) on the tractor.

	WARNING: When connecting hydraulic hoses, tractor hydraulic valves must not be under pressure!

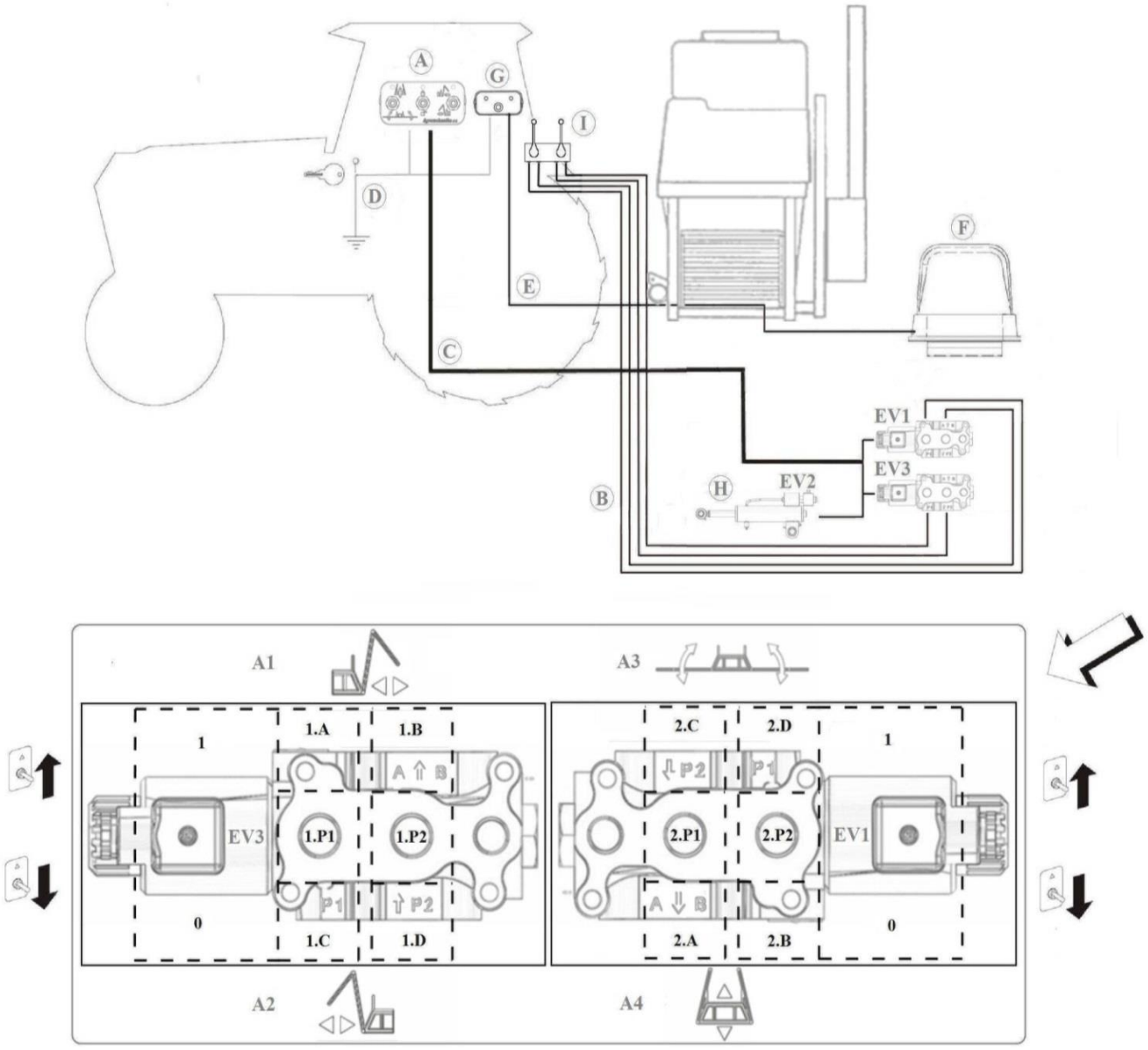


Figure 11.4

⇒ MEANING OF MARKINGS IN CONNECTION SCHEME

Marking	Description	Note
A	Control panel for control of equipment	
B	Connection hydraulic hoses with clamps for connection to tractor	
C	Connection cable between control panel, hydraulic valves and block	
D	Supply cable + supply plug	
E	Connection cable between marker control panel and marker	
F	Marker (additional equipment)	
G	Control panel for marker control	
H	Hydraulic cylinder for block	
I	Tractor levers for control of functions of hydraulic valves	
EV1, EV3	Solenoid hydraulic valves 6/2	
EV2	Hydraulic valve 2/2	
P1, P2	Supply tractor hydraulic connection 1.P1, 1.P2 – unmarked pair of hydraulic hoses 2.P1, 2.P2 – yellow pair of hydraulic hoses	
1A-1B, **1C-1D,** **2A-2B,** **2C-2D,**	Hydraulic connections for connection of right side booms of spraying equipment Hydraulic connections for connection of left side booms of spraying equipment Hydraulic connections for connection of main cylinder on spraying equipment Hydraulic connections for connection of levelling on spraying equipment	
A1	Opening/closing of right side of booms of spraying equipment	
A2	Opening/closing of left side of booms of spraying equipment	
A3	Levelling of spraying equipment	
A4	Lifting/lowering of main cylinder of spraying equipment	
EV3 1 **0**	Switch to section A1 Switch to section A2	
EV1 1 **0**	Switch to section A3 Switch to section A4	

11.3 TRANSPORT SAFETIES

Spraying equipment is fitted with mechanical safety, which prevents uncontrolled opening of side booms in transport position. Transport position of spraying equipment is clearly defined and mechanically secured in this position. This is provided by mechanical safeties, attached to the frame of the sprayer. Sprayer with sprayer equipment works as a harmonized whole. When lifting the spraying equipment, mechanical safeties release and all hydraulic functions can be controlled. When closing the equipment, spraying equipment must first be lifted to activate non-reverse hydraulic valve (see chapter "PROTECTION FROM OPENING AND CLOSING OF BOOMS"), then folded by electro-hydraulic control and then lowered onto mechanical safeties, so that they function.

11.3.1 MECHANICAL SAFETIES FOR CONNECTION OF SPRAYER AND SPRAYING EQUIPMENT

Display of releasing mechanical safety of spraying equipment on sprayer for transport.

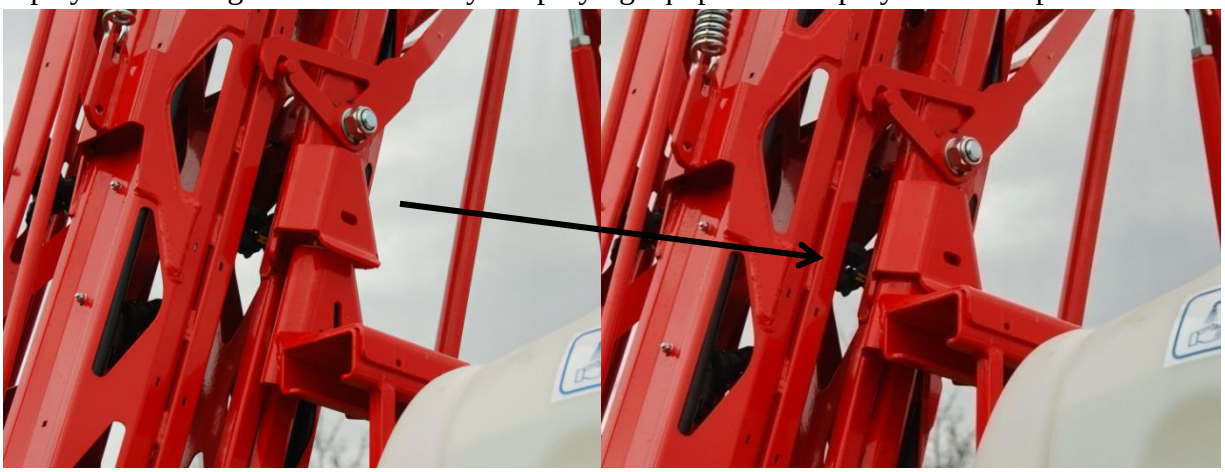


Figure 11.5

	WARNING: Be careful of order of opening and closing of spraying equipment!

11.3.2 MECHANICAL SAFETIES AGAINST OPENING OF BOOMS IN TRANSPORT POSITION

Display of mechanical safety of booms in transport position.

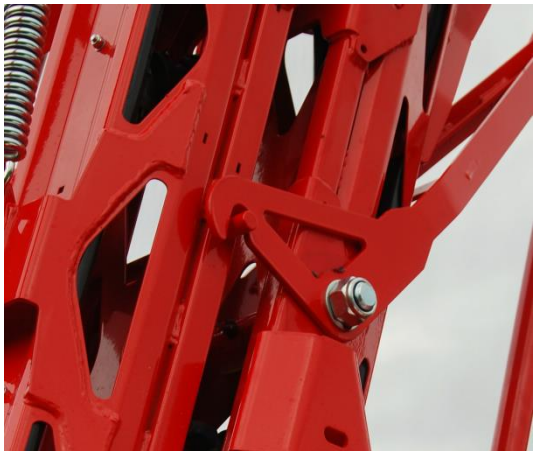


Figure 11.6

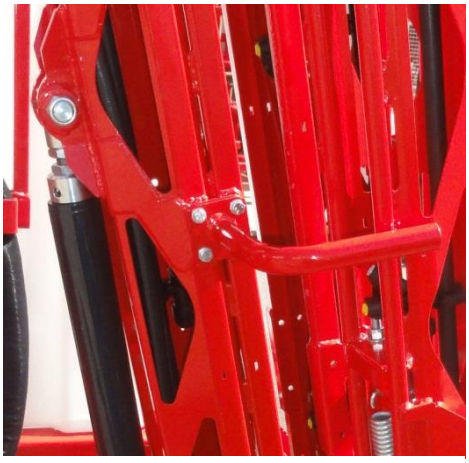
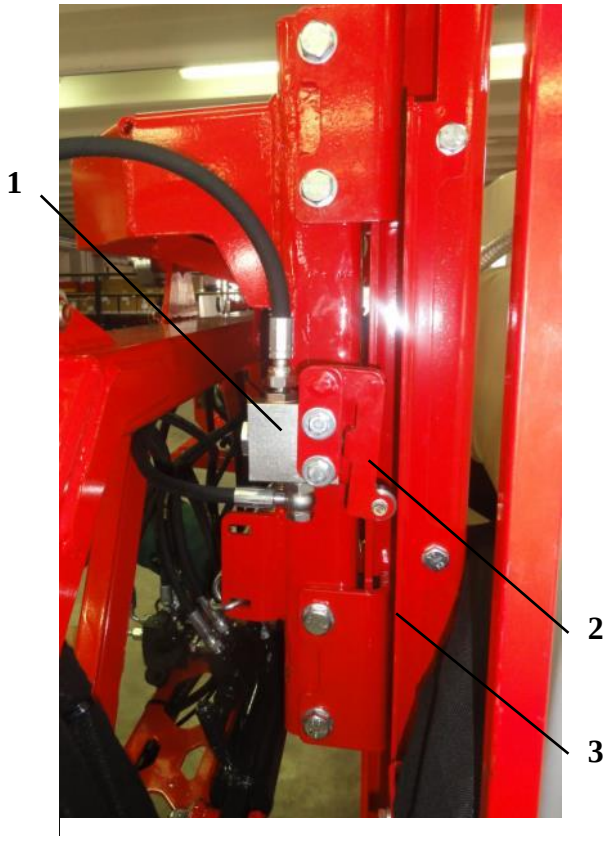


Figure 11.7

	WARNING: Incorrectly folded spraying equipment to transport position does not ensure safety from uncontrolled opening of booms during transport!

11.3.3 SAFETY AGAINST OPENING AND CLOSING OF BOOMS

Spraying equipment is equipped with a system, which disables opening or closing of booms in working height of spraying equipment. This is provided by a hydraulic valve through a mechanism with a wheel. Hydraulic valve with a wheel travels along a guide. This if formed so that it activates at certain height and releases oil flow through non-reverse hydraulic valve to valves for control of opening;
Until the spraying equipment is in position or is lowered so far that the mechanism with the wheel is not activated, then the hydraulic valve does not allow booms to be opened, only lift hydraulic cylinder on the spraying equipment is working.



1. Hydraulic valve
2. Mechanism with wheel
3. Guide

Figure 11.8

	WARNING: <u>Never perform levelling in transport position of spraying equipment!</u> Otherwise, faults of the spraying equipment can occur!

11.4 CHARACTERISTICS OF SPRAYING EQUIPMENT 15 MY-H, 16MY-H AND 18MY-H

Spraying equipment type MY-H is hydraulic spraying equipment. They are controlled from tractor cabin.
Main component parts of spraying equipment are:
- guide AGS (carried) (018.01.616),
- shoulder carrier (018.01.649),
- shoulders (018.01.651),
- oscillating lever (018.01.650),
- boom 1-L (018.01.655),
- boom 1-D (018.01.656),
- boom 2-L (018.01.657),
- boom 2-D (018.01.658),
- pivot joint 3-L (018.01.659),
- pivot joint 3-D (018.01.660),
- boom 3.
- Three different sizes of booms are used, depending on size of equipment:
    - for 15 MY-H, two in-built nozzle carriers Tri-Jet (018.01.663)
    - for 16 MY-H, three in-built nozzle carriers Tri-Jet (018.01.662)
    - for 18 MY-H, five in-built nozzle carriers Tri-Jet (018.01.661)

Individual parts of spraying equipment are described in the following.

11.4.1 HYDRAULIC LIFT

Hydraulic lift is the same for all spraying equipments. Hydraulic cylinder acts in one way. Safety is provided by double blocking valve (1), which prevents sudden drop of spraying equipment in case of breaking of hoses. Speed of lifting of spraying equipment is controlled by a choke valve (2) on the top of hydraulic cylinder.

Figure 11.9

Figure 11.10

11.4.2 SINGLE-POINT HITCH OF SPRAYING EQUIPMENT AND LATERAL STABILIZATION

Shoulder hitch to cart is done in one point (eye bearing), which enables movement of spraying equipment in all directions and good gravity point. Polyurethane springs ensure middle position and good response. System is equipped with two greasing points for lubrication (3, 4) in the point of eye bearing hitch (figure 11.11) and shoulder slider (figure 11.13).

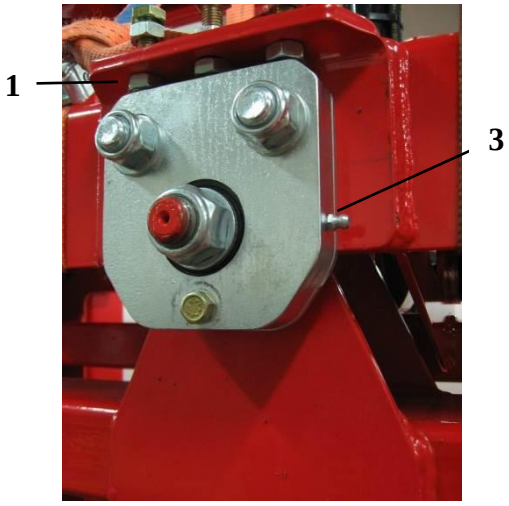


Figure 11.11

Figure 11.12

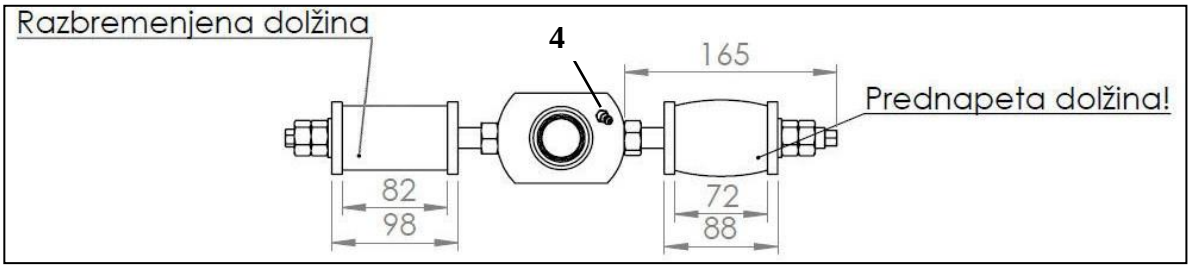


Figure 11.13

Height setting of equipment is done with screw (1) on the top of the eye bearing (figure 11.11), and perpendicularity between spraying equipment and sprayer in ensured by polyurethane springs (2), which must be equally set or pre-strained (figure 11.13) to ensure, in case of lateral inclination of spraying equipment, its positioning in original position (figure 11.14).

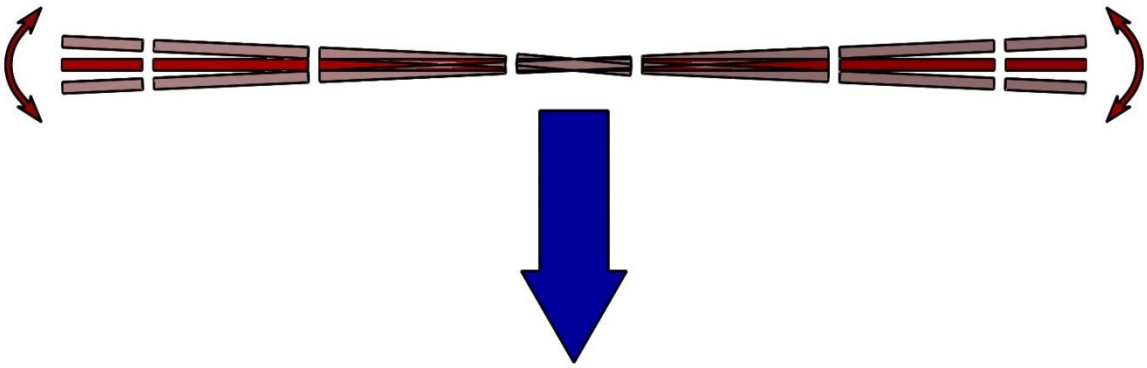


Figure 11.14

11.4.3 HYDRAULIC BLOCK AND DAMPING

Dampening of spraying equipment and its blocking is provided by the system of hydraulic cylinder (1), which is fastened between shoulder cart (5) and oscillating lever (4).
Horizontal position of the sprayer requires that tensile springs (8) on the spraying equipment are equally stressed on oscillating lever, so that, together with hydraulic cylinder, in case of inclination on one side, they can enable spraying equipment in one oscillating frequency to return to its original horizontal position.

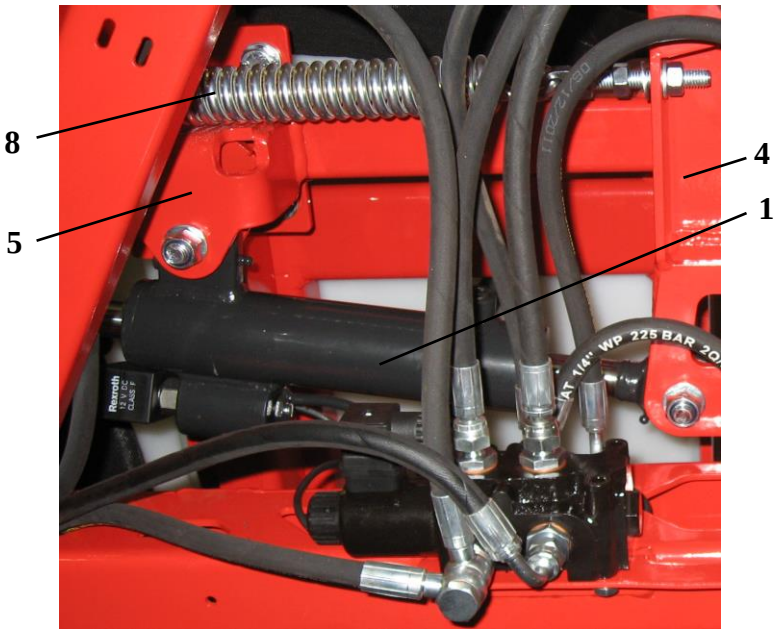


Figure 11.15

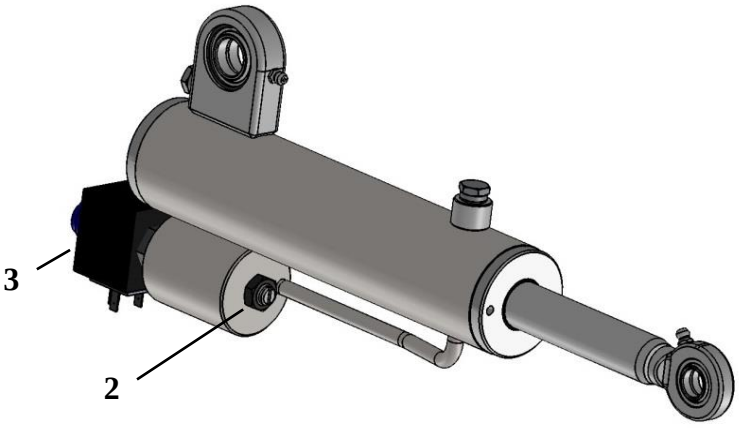


Figure 11.16

Legend for figure 11.15 and figure 11.16:
1. Hydraulic cylinder of block and damper
2. Damper for setting response of damping
3. Solenoid valve
4. Oscillating lever of spraying equipment
5. Shoulder carrier (cart)
8. Tensile spring

⇒ FILLING OF HYDRAULIC CYLINDER

Hydraulic cylinder is of closed type and is not connected to hydraulic hoses. Before first installation of hydraulic cylinder to spraying equipment, procedure of filling on a special device (figure 11.17) follows. Oil ATF is used for filling of the hydraulic cylinder.

Figure 11.17

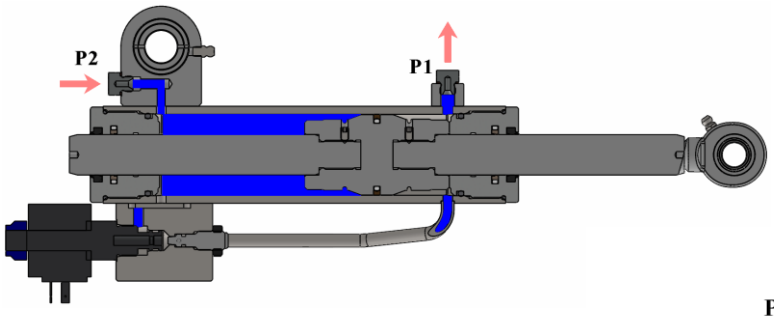


Figure 11.18

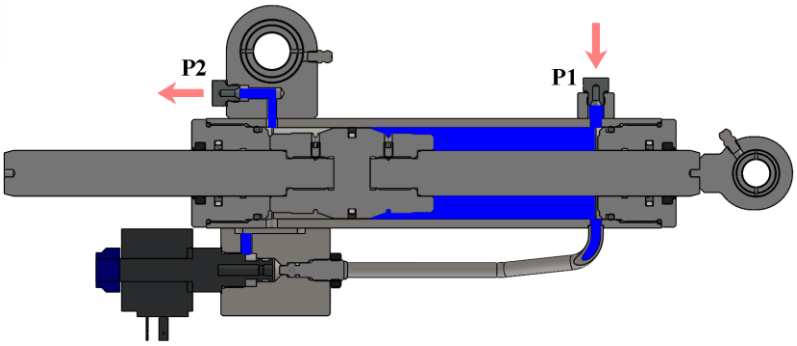


Figure 11.19

PROCEDURE OF FILLING OF HYDRAULIC CYLINDER

- Before connecting the cylinder, all connections for hydraulic hoses must be facing upwards, due to air displacement during filling.
- Connect hydraulic hoses P1 and P2 to cylinder connections.
- Start of filling:
  - Cylinder starts filling from one side, through hydraulic hose P2, piston starts moving outwards.
  - When piston reaches end point, oil starts to flow through electric hydraulic valve and damper into the other part of the cylinder and back in the filling device through hydraulic hose P1.
  - At uninterrupted filling, after certain still time of piston in end point due to aeration, divert oil flow on the device in the opposite direction and repeat filling, done in reverse order.
  - Repeat the filling procedure until airless space in the cylinder is ensured.
  - Piston in the cylinder moves with steady response, set through the damper.

- End of filling:
  - Disconnect hydraulic hose P1, welding coil must be full and without air bubbles, if not, repeat filling procedure.
  - Seal the connection with plug G 1/8″.
  - Set the cylinder perpendicularly to connection P2. Connection must be in the highest top position.
  - Disconnect hydraulic hose P2, welding coil must be full and without air bubbles, if not, repeat filling procedure.
  - Seal the connection with plug G 1/8″.

	WARNING: Always use prescribed oil ATF for filling!

⇒ OPERATION OF HYDRAULIC CYLINDER

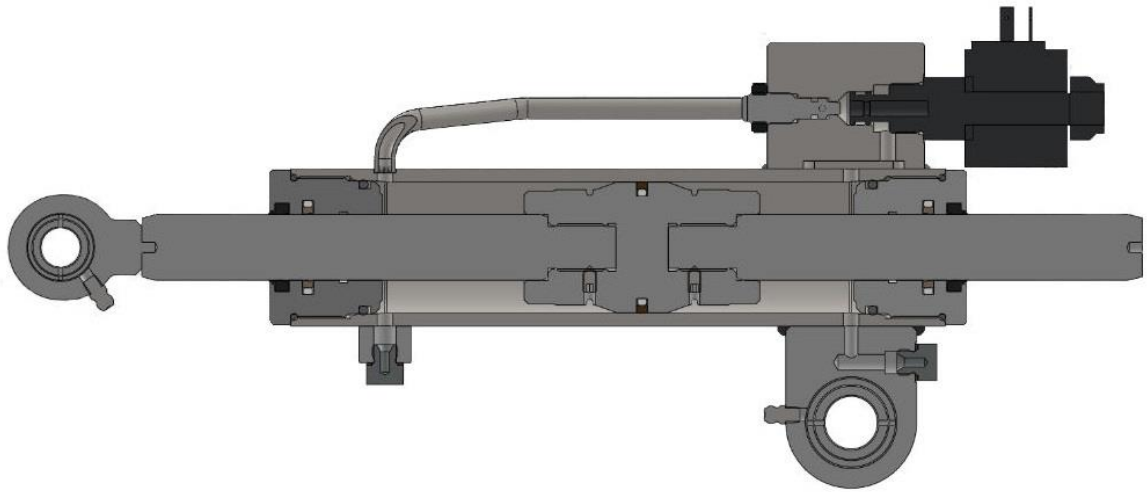


Figure 11.20

Cylinder operates by system of closed circle with intermediate solenoid valve (3). Valve is open in basic position, which enables floating hitch of equipment. Cylinder response is set by damper (2) and tensioning devices (7) for pre-tensioning of tensile spring (8).
In case of blocking, activate blocking switch on control panel (indicator on) and close the solenoid valve (3), which disables oil flow. Equipment is now fixed with cart and is rigidly connected to chassis of sprayer. Block is intended for use when opening and closing the equipment at standstill and for spraying with partially one-side closed booms.

	WARNING: Activated block is not intended for normal work, but is intended only for opening and closing of spraying equipment and in case of spraying with partially one-side closed booms!

In case of spraying with partially one-side closed booms, tractor speed must be reduced accordingly, to prevent overturning and damage to sprayer and spraying equipment.

11.4.4 HYDRAULIC LEVELLING

Levelling cylinder (9) is fastened between the shoulder (6) and oscillating lever (4). Response of levelling cylinder is set by damper (2). Hydraulic levelling sets balance position of spraying equipment (horizontal position), and also sets parallelism of equipment with terrain, in case of inclined terrain. If the block is activated, position of spraying equipment can be set, as well as if booms are folded on one side.

Hydraulic levelling can have significant effect on linear distribution of spray onto the surface and quality of spraying. This is why the system is extremely useful on diverse and inclined terrain.

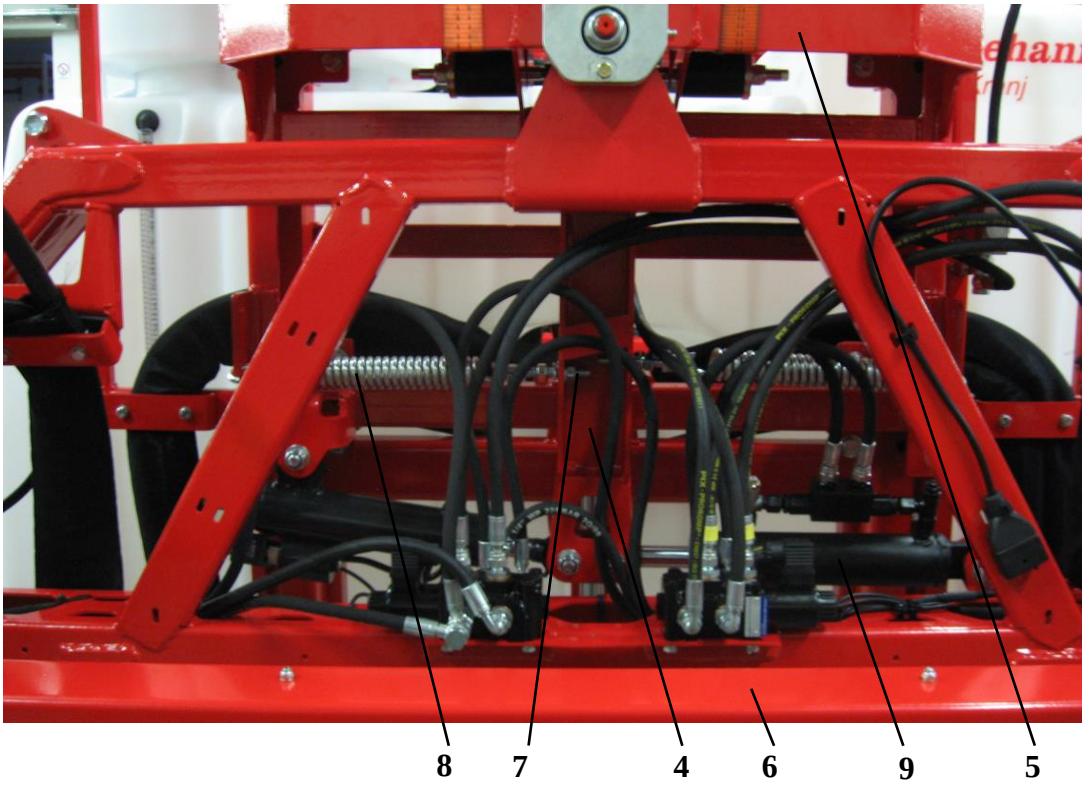
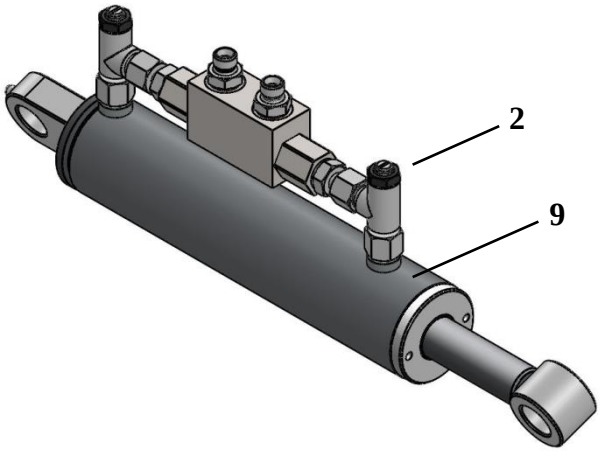


Figure 11.21

Legend of figures 11.21 and 11.22:
2. Damper for setting response of damping
4. Oscillating lever of spraying equipment
5. Shoulder carrier (cart)
6. Shoulder of spraying equipment
7. Tensioning devices
8. Tensile spring
9. Levelling cylinder



Slika 11.22

11.4.5 ADJUSTABLE GUIDES

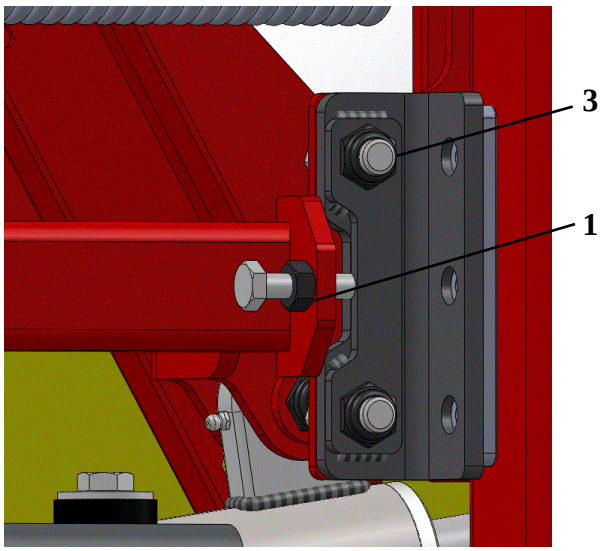
Adjustable guides of cart ensure elimination of air. Guides have slide plates!

Figure 11.23

	WARNING: When setting guides, spraying equipment must be open!

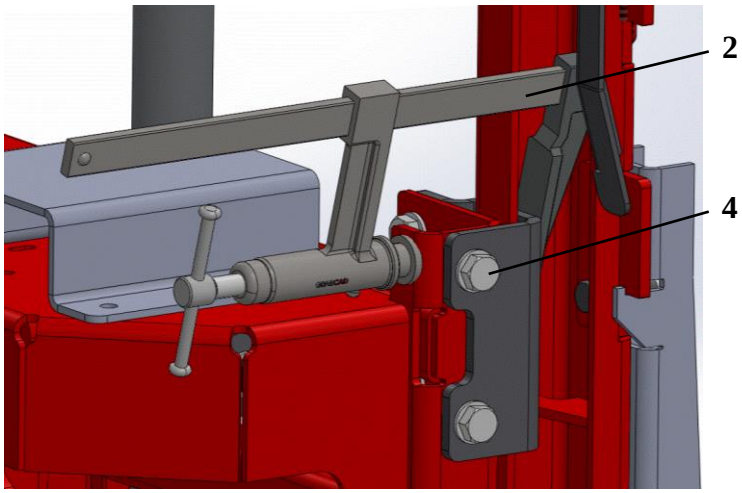
⇒ GUIDE SETTING

Guides with minimal airiness connect shoulder carrier with sprayer frame.



Guides, which slide on the interior side of frame (figure 11.24), are set by an adjustable screw (1). Partially unscrew the screws (3), which are fixing the guide. Setting is done with adjustable screw (1) until guide does not reach minimum airiness. After reaching desired airiness, fix the guide with screws (3) to shoulder carrier.

Figure 11.24



Setting procedure is similar for guides, sliding on the exterior side of frame, only exception being that you have to use a manual vice. Fix the manual vice to guide and shoulder carrier (figure 11.25). After achieving desired airiness, partially unscrew screws (4), so that the guide manually closes to its working side on the frame. After finishing setting, fix the guide with screws (4) to shoulder carrier and release and remove the vice.

Figure 11.25

11.4.6 PNEUMATIC SUSPENSION OF SPRAYING EQUIPMENT

Vertical suspension of spraying equipment is done with two pneumatic cushions (1), which are interconnected with pneumatic connection (6) and fitting for filling (5). Pneumatic cushions are filled with air under high pressure (P_{max} = 8 bar). How full are the cushions, depends on equipment weight. Cushions are filled with open equipment and horizontal position. Indicator of fullness is checked with height of link profile (3). On the attached warning label (figure 11.26) are recommended heights (mm). Hydraulic cylinder (4) is fastened in link profile (3) and shoulder carrier. Link profile is guided through the guide (2) and is limited with a screw on top. Suspension response depends on correct fullness of cushions, state of guides, airiness of guides and lubrication of guides.

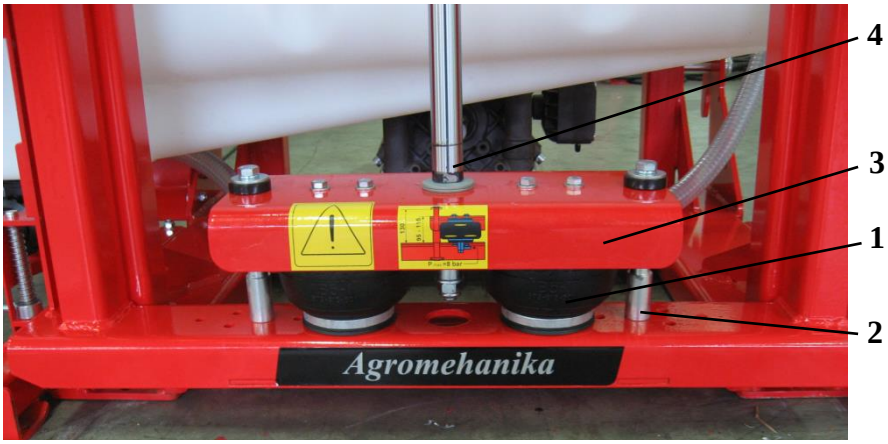


Figure 11.26

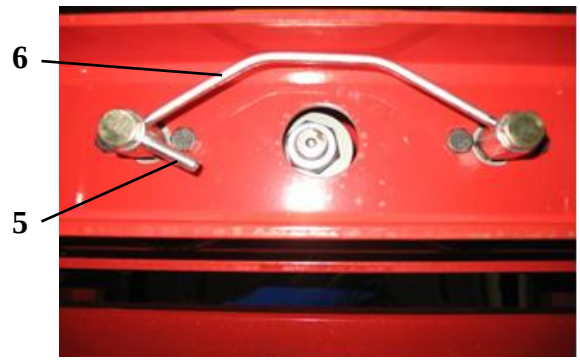


Figure 11.27

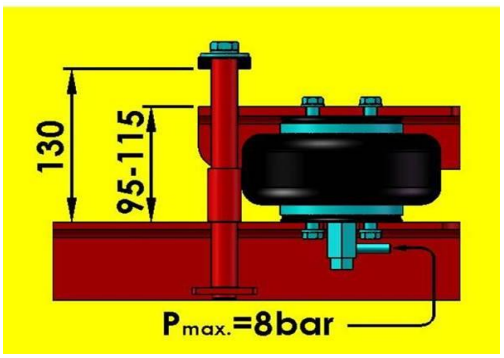


Figure 11.28

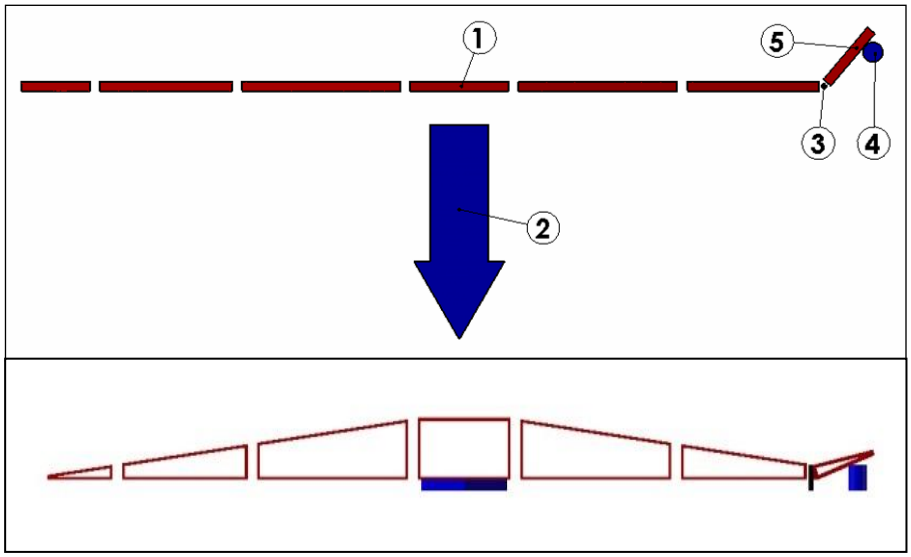
	WARNING: Check fullness of pneumatic cushions before each use. Maximum pressure is 8 bar. Fullness of cushions depends on type of spraying equipment and is determined by measuring recommended height!

11.4.7 SAFETY BOOM AND SPRING SLIDER

⇒ SAFETY BOOM

Figure 11.29

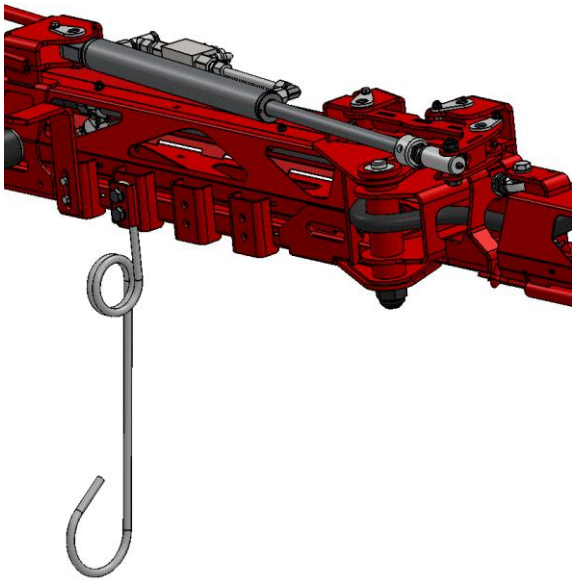
Rear boom (third boom) is fastened, through adjustable screw, in single point in top part, and elastically with spring in the bottom part, which enables movement of boom left, right and up. In case of an obstacle or contact with the ground, boom moves away and returns to original position.



Marking	Description
1	Spraying equipment
2	Driving direction
3	Safety joint
4	Obstacle
5	Safety boom

Figure 11.30

⇒ SPRING SLIDER



Spring slider prevents impact of equipment with the ground in case of sudden inclination of the sprayer! Spring slider can be, according to needs, as well as optionally, adjusted to four different positions on the boom.

Figure 11.31

11.4.8 SHOULDER AND BOOM PIVOTS

Fastening of first boom on shoulder and fastening between booms (second and third boom) is pivoted with slide bushings (1). All joint connection through pivoted slide bushings are connected with bolts (2). At places of fastening, additional greasing points (3) for lubrication of pivots are given.

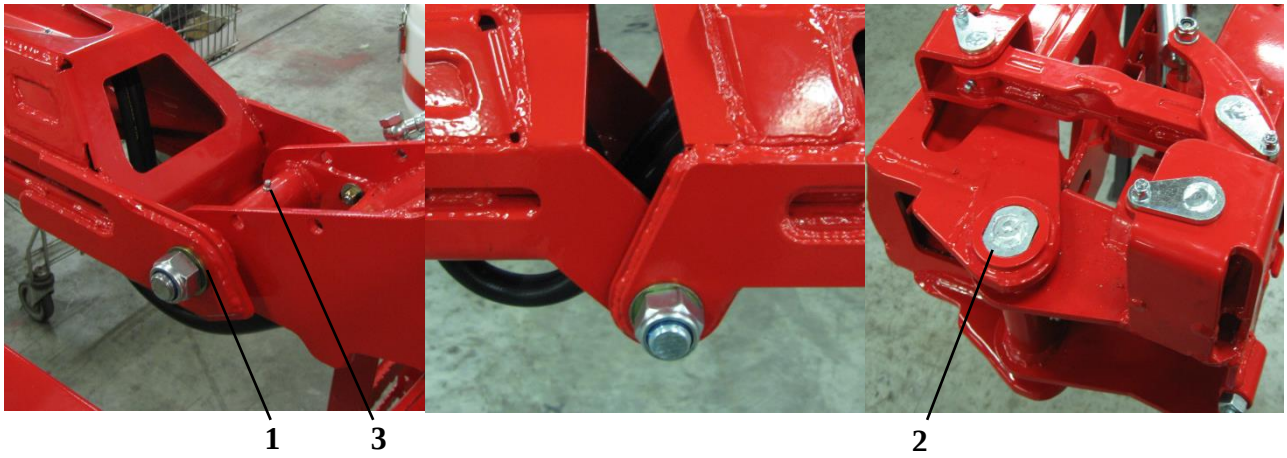


Figure 11.32

11.4.9 BOOM OPENING MECHANISM

Mechanism for opening first boom is done directly through hydraulic cylinder (1) (figure 11.43), fastened to shoulder and first boom. Parallelism and rigidness of first boom with spraying equipment are ensure by tensioning pole (2), which also connects the second boom through link lever (2).

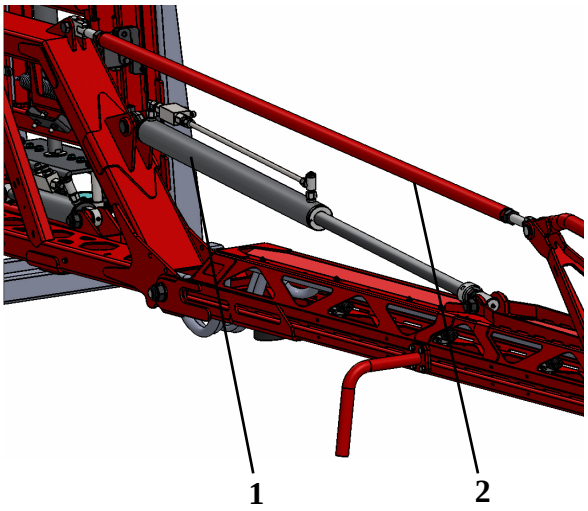


Figure 11.33

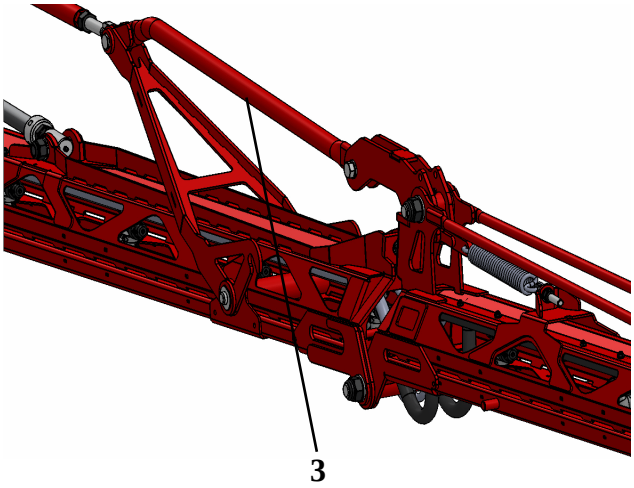


Figure 11.34

Adjustable screw (4) between joint part ensures that booms 1 and 2 are in parallel position.

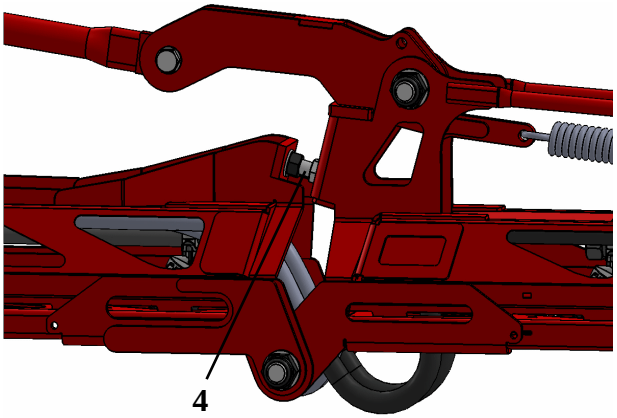


Figure 11.35

Opening of third boom is done by hydraulic valve (5), which, upon lowering of both booms, activates the second cylinder (6) (figure 11.44), connected to three-point hitched mechanism, through lever (7) and shifter (8).

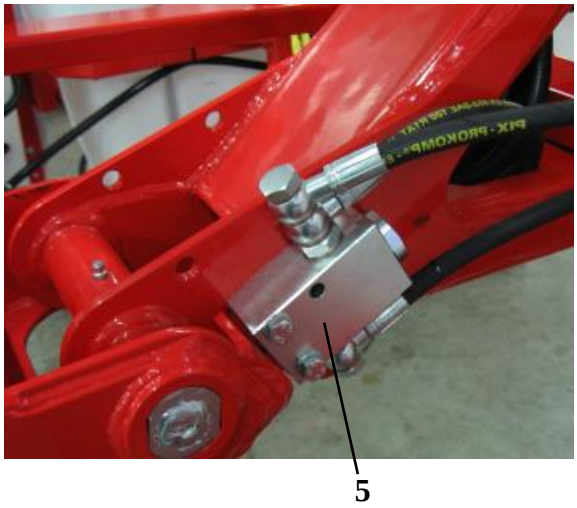


Figure 11.36

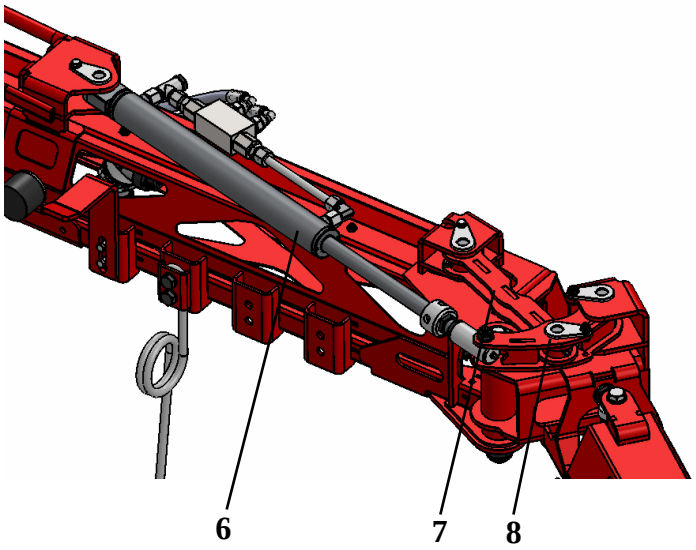


Figure 11.37

Two adjustable screws (9, 10) on safety joint and between joint part ensure parallelism and parallel position of third boom with second boom.

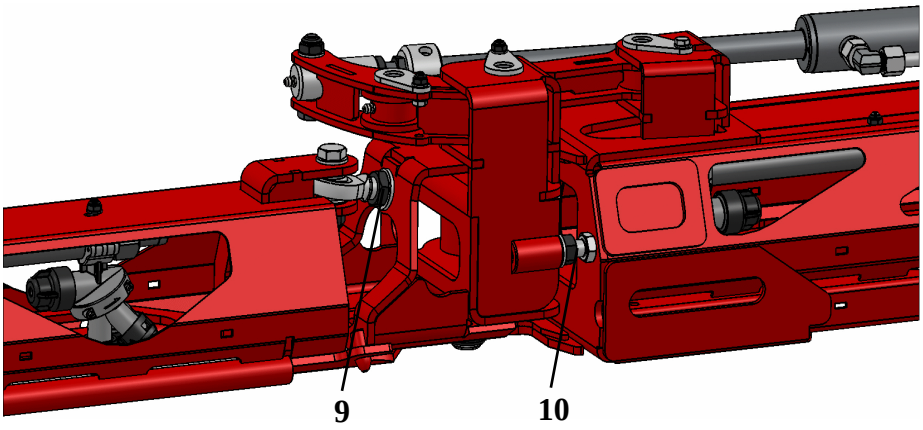


Figure 11.38

All joints are fitted with greasing point (11) for lubrication.

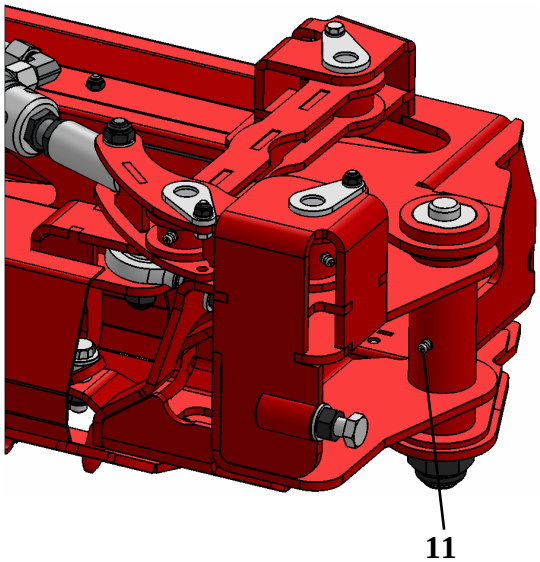


Figure 11.39

⇒ HYDRAULIC CYLINDERS FOR CONTROL OF BOOMS

For final setting of both hydraulic cylinders with booms of spraying equipment, both have a nut (1) and end fitting (2) at the hitching part. Nut enables the cylinder to limit position of closing of booms, end fitting on hydraulic cylinder enables end position of opened equipment.

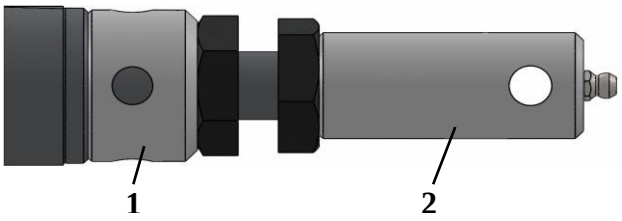


Figure 11.40

Hyd.cylinder for lifting – lowering of first booms

Figure 11.41

Hyd. cylinder for opening – closing third booms

Figure 11.42

	WARNING: Hydraulic cylinder for lifting and lowering first booms with extended length must not be stressed – no force can be applied to it!

11.4.10 SETTING SPEED OF HYDRAULIC CYLINDERS

Hydraulic cylinders are equipped with double blocking valve (2) and damper (3). Double blocking valve retains position of hydraulic cylinder (1) and secures from sudden fall in case of breaking of hydraulic hoses. Damper sets speed of hydraulic cylinder. Spraying equipment is set so that one working cycle of opening or closing of one boom lasts 25 s.

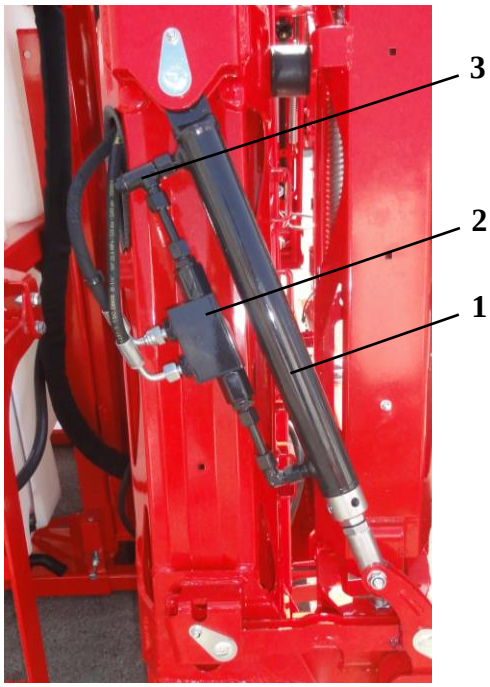


Figure 11.43

11.5 OPERATION DESCRIPTION

Handling of equipment can be done if the sprayer with the sprayer equipment is properly connected to tractor (see chapter "CONNECTION OF SPRAYER TO TRACTOR"). Connect hydraulic hoses of sprayer to hydraulic connections of tractor and connect control panel for controlling hydraulic equipment. Control of spraying equipment is performed on a flat surface and tractor at standstill.

	WARNING: Opening and closing of hydraulic spraying equipment should not be done while driving, because overturn or damage to spraying device can occur.

11.5.1 OPENING OF SPRAYING EQUIPMENT

Handling is done through control panel and functions, described in chapter 11.2.1. When opening equipment from transport to working position, first activate blocking switch (red indicator), then lift spraying equipment with switch for lift to position of activation of mechanism with wheel (see chapter "PROTECTION FROM OPENING AND CLOSING OF BOOMS"), then start opening booms and activate switch for right or left side. Indicator lights red for activated side. Use handles on the tractor to lower the right and then left side of booms or vice versa. This releases mechanical safeties against opening booms in transport position. Release block (indicator off). Use switch for hydraulic levelling to level spraying equipment and lower it appropriate height with lift switch.

Figure 11.44

During work (driving), use lift and levelling to set position of spraying equipment.
Other functions should be used at tractor standstill. Use switches for opening and closing to check openness of hydraulic cylinders and ensure rigidness of equipment.
Release of cylinders occurs due to air in the system or poor sealing of hydraulic components.

	WARNING: Always activate block first and then open first booms. This releases mechanical safeties against opening booms in transport position!

11.5.2 CLOSING OF SPRAYING EQUIPMENT

Equipment must first be raised to starting position of activation of mechanism with wheel. Use hydraulic levelling to align it, so that it is parallel to the sprayer, and activate block. Closing of spraying equipment is done in reverse order as opening. At the end, release spraying equipment on mechanical safeties of sprayer, shut off block and control panel. Sprayer is ready for transport.

	WARNING: During opening and closing of spraying equipment, nobody is allowed to be in the working area!

11.5.3 WORK WITH SPRAYING EQUIPMENT

Drive the tractor to starting point of spraying. Open spraying equipment (see chapter "OPENING OF SPRAYING EQUIPMENT"). Be careful of safety of others.
During spraying, avoid sudden braking, especially when the equipment is partially open.
At the end of the field or parcel, make sure that you turn around safely. While turning, regard the length of open equipment and arch, done while turning. If there is road traffic along the field or parcel, be extremely careful on other participants. If turning is not possible, abort spraying, close the spraying equipment and turn the tractor with closed spraying equipment.

11.5.4 WORK WITH CLOSED BOOMS ON ONE SIDE

In case of using spraying equipment with booms closed on one side, you must first activate block, lift equipment in position of activation of mechanism with wheel, open first booms of equipment (mechanical safeties against opening of booms in transport position). Now open the booms on desired side. Use hydraulic levelling to adjust spraying equipment. Begin spraying process.

11.6 SPRAYING SECTIONS AND NOZZLES

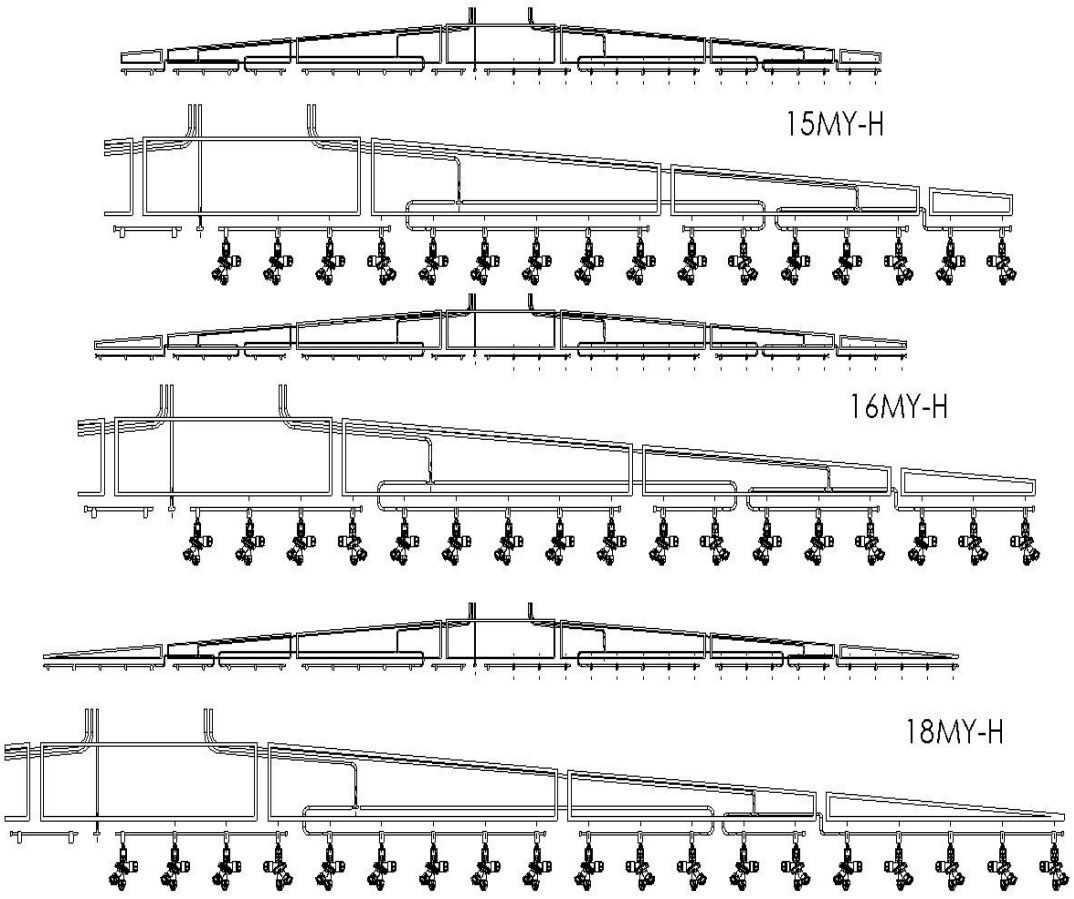


Figure 11.45

All three types of equipment are equipped with five sections. Spraying sections are arranged across the equipment so that they enable minimum pressure fall in hoses and best distribution of spraying product to individual nozzle (figure 11.45). Installation of hoses is done from diversion valve on pressure regulator to nozzles. Hoses are connected to diversion valve with quick clamps.

11.6.1 CONNECTION SCHEME

Connection of sections is displayed in figure 11.45.

Working width	(m)	15					16					18				
Number of sections		5														
Number of nozzles per section		5	7	6	7	5	6	7	6	7	6	7	8	6	8	7

11.6.2 SPRAYING HOSES

Shapes of spraying hoses (PE), used on spraying equipment, type H, are displayed in figure below. They are marked with a number marking.

Example: spraying hose 2/2

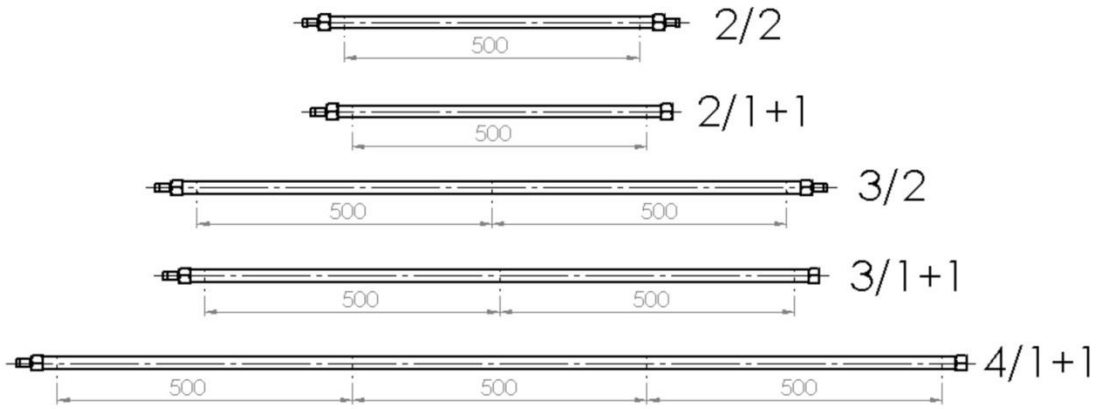


Figure 11.46

11.7 TRI-JET NOZZLE CARRIER

Spraying equipment is, as standard, equipped with TRI-JET nozzle carriers, which contain three different nozzle mouthpieces ST 120-02, ST 120-04 and ST 120-06.
Their fixing is done with nuts of nozzle (1), shape and colour of which is different for different types of nozzle mouthpieces (2). By rotating the lower part of the carrier (clockwise, until it locks), it is possible to easily replace the nozzle mouthpiece, required for spraying in a given moment.
These carriers are also equipped with anti-dripping membrane valve (3) for prevention of uncontrolled dripping from nozzles.
Component parts of nozzle carrier are displayed in the catalogue of spare parts.

Figure 11.47

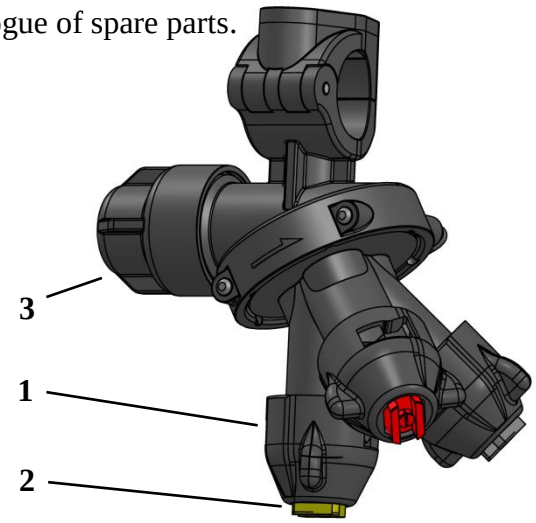


Figure 11.48

12 MAINTENANCE OF SPRAYING EQUIPMENT

Periodically check screws and bolts, pins and especially safety pins, their tightness and their condition. Tighten or replace them if necessary.
The equipment is equipped with some adjusting bolts, which need to be adjusted from time to time. To do this, open the arms of the equipment in the working position and adjust the arms of the equipment which must be parallel to the shoulder of the spraying equipment.

	IMPORTANT: make sure that you have attached and tightened the nuts of the adjustment bolts after adjusting the spraying equipment.

GREASING:
Grease all moving parts of your spraying equipment after every 40 working hours. The spanners on the trapezium and the axes of the hydraulic equipments is equipped with greasers type:

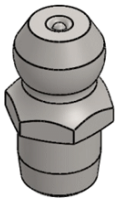
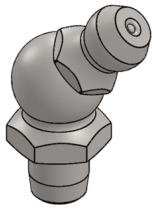
DIN 71412 Type A  **DIN 71412 Type B** 

Figure 12.1

In the case your spraying equipment is being cleaned by a high-pressure cleaning appliance, it is recommended to grease all parts after every single cleaning.
After washing the spraying equipment, check if any of the hoses or joints leaks and check the condition of the flexible hoses. Repair broken hoses or loose joints in good time, since that kind of errors can cost you a lot of time during spraying.
Some insecticides contain solvents which affect the paint. Clean the corrosion off of colourless parts of the spraying equipment and apply some new paint.

12.1 CLEANING THE SPRAYING DEVICE

After every single use of the sprayer, the appliance must be thoroughly cleaned. The best way to use any excess insecticide is to dilute it with water and spray it on the same surface again. The concentration should be at least 10% (10 units of water per one unit of insecticide), the spraying speed slightly faster and the spraying pressure slightly lower (1.5 bar, depending on the nozzle). While doing this, use the additional reservoir for washing. The procedure is described in the chapter “COMPLETE CLEANING OF THE SPRAYER”. After that, thoroughly clean the sprayer on the inside and the outside and also clean all tolls which you have used for spraying (including the tractor). Use only detergents that are recommended by the manufacturer of protection agents! If there are instructions for cleaning of the appliance after using it attached to the instructions for using the insecticide, follow them.
In accordance with the local legislation on washing of the pesticides into the earth, agree on cleaning of your sprayer with your advisory service.
The ablution of pesticides (cleaning of the sprayer) must not be performed on swampy ground or in the near of streams, water dams, dykes or water fountains, etc.
If there is still some insecticide inside the sprayer and if you had to stop working unexpectedly for some time it is recommended to clean the pump, the regulator and the spraying lining with clean water (see chapter PARTIAL CLEANING OF THE SPRAYER).
In the case you had to stop working unexpectedly but did not clean the sprayer yet, you have to assure that other people or animals cannot reach the sprayer.

	WARNING: - **Only a clean sprayer appliance is a safe appliance.** - **A clean sprayer appliance is ready to be used.** - **A clean sprayer appliance cannot get damaged by chemical agents or chemical solvents.**

When cleaning the sprayer use appropriate protection clothes. Choose appropriate detergents for cleaning and, if necessary, appropriate insecticide neutralising agents (see recommendations of the insecticide manufacturer). In the case you are using a mixture of detergent and water for cleaning, pour it into the main reservoir, close the main valve on the pressure regulator, turn on the pump, open the direction control valve for mixing, open the self-cleaning filter valve and only after few minutes open the direction control valves of the nozzles. Be careful when choosing the place for releasing of the cleaning agent. Some detergents become active only after few minutes, so the cleaning process can be slightly longer (see instructions of the manufacturer).

	WARNING: Be careful while handling detergents; follow the instructions of the manufacturer!

After cleaning the sprayer with a detergent, fill at least 1/5 of the tank with clean water and repeat the cleaning process. Make sure that you have cleaned all elements that have come in contact with the insecticide or the detergent. Make sure that you have precisely cleaned all filters. Be careful not to damage the fabric on the filter insert while cleaning filters. If the filter insert is damaged, replace it with a new one. (A more precise description about cleaning of the pressure filter can be found in the chapter “SUCTION FILTER – CLEANING THE SUCTION FILTER”).
At the end of the cleaning process, clean all nozzles. Nozzles can be cleaned only by means of a soft brush, compressed air or water. You can damage the nozzle when cleaning it with a hard item.

	WARNING: In the case your spraying equipment is being cleaned by a high-pressure cleaning appliance, it is recommended to grease all moving parts after every single cleaning!

12.2 MAINTENANCE AND STORAGE AFTER SEASON

When the spraying season is over, find some time and prepare the spraying appliance for storage. Before storing the appliance, thoroughly clean the inside and the outside of the sprayer (regulator, pump, sieves, selection valves, nozzles, etc.). When the cleaning is done make sure that there is no water left in the valves, the filters, the pump, the nozzles, etc. Do not maintain the sprayer until it has not been thoroughly cleaned.

12.2.1 HOSES

Check the tightness of all hoses and hose junctions. Replace damaged hoses with new ones. A damaged hose cost you a lot of time during spraying.

12.2.2 PAINT

Some insecticides contain solvents which affect the paint. Clean the corrosion off of colourless parts of the spraying appliance and apply some new paint.

12.2.3 RESERVOIR

Make sure that there are no rests of insecticide inside the reservoir. Chemical agents must not stay in the reservoir for long time, since they can fast shorten the durability of the reservoir and other parts. Make sure that the outflow valve is opened.

12.2.4 PRESSURE REGULATOR

Protect the pressure regulator against moisture and dust. It is recommended to grease moving parts with WD-40 or oil. There are further instructions about the maintenance of the regulator in chapter "MAINTENANCE OF PRESSURE REGULATOR".

12.2.5 PUMP

After every season, thoroughly clean the inside and the outside of the pump and prepare it for storage. Check the quantity of working hours and, if necessary, repair the pump (oil change, membrane change, sealing change, etc.) or at least check the oil level, the sealing, etc. This is the most appropriate time of the season to perform some maintenance work. If you are not sure whether or not you can repair the pump on your own, leave the work to an authorized expert. You can find the description about maintenance work in the chapter "PUMPS".

12.2.6 DRIVE/CARDAN SHAFT

It is very important that the safety pin, which is attached to the head of the cardan shaft, is clean and greased. This assures that the shaft is safe to use.
Check the protective cover, the functioning and the condition of the cardan shaft every 40 working hours. Replace damaged parts with new ones.
Check the protective cover of the cardan shaft every 100 working hours and, if necessary, replace the sliding plates of the protection. Also check the condition of the cardan shaft. Pay special attention to the safety pin. Replace damaged parts with new ones.

12.2.7 BOLTS

IMPORTANT: Check the bolts, pins and especially safety pins, their tightness and their condition. If necessary, tighten or replace them. The information on the necessary bolt tightness can be found in the table “Bolt tightening torque” (in the chapter “BOLT TIGHTENING TORQUE”).

12.2.8 HOSE JUNCTIONS

Reasons for bad sealing of hose junctions:

- missing O-rings or sealings;
- damaged or poorly inserted sealings;
- dry or re-formed sealing or. O-ring;
- unsuitable joints;
  ⇒ In the case of bad sealing or leaking:
- DO NOT TIGHTEN the joint too hard, since you can easily damage it. Take the joint apart and check the condition and position of the sealing or the O-ring, clean and grease it and reassemble the joint.
- Use only non-mineral grease (bio-grease) for greasing.

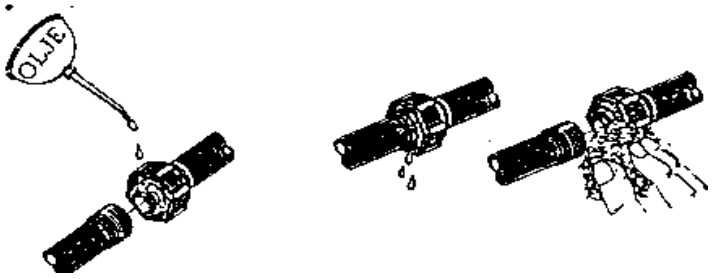


Figure 12.2

REMEMBER:

- it is sufficient to tighten the joint by hand (radial sealing);
- it is sufficient to tighten the joint by a hand tool (axial sealing).

Figure 12.3

12.2.9 OTHER PARTS

The rest of the vital parts such as filter inserts, pouring sieve, additional equipment, etc. must be thoroughly cleaned, checked and replaced if necessary, too. Remove the remaining water and eventual sediments from parts such as suction filters and three-way valves. Grease all moving and sliding parts of the sprayer.

WARNING: If the temperatures get below zero, protect the spraying appliance against cold, which could damage it!

To protect the appliance against cold, follow the instructions written below:

- either remove all water from the pump, the regulator, the hoses, the filters and other elements of the sprayer;
- either store the appliance in a warm room;
- or use an agent against freezing (antifreeze) in accordance with the following procedure:

After you have finished cleaning the spraying appliance, completely empty the reservoir and pour at least 10 litres of antifreeze agent (a mixture of water and antifreeze) and turn on the pump. Open all valves on the regulator in order the antifreeze agent can reach all hoses and nozzles. At the end, empty the remaining agent from the reservoir into the tank and let the pump operate for few more minutes in order to pump the remaining agent into the tank.

WARNING: Make sure that the antifreeze agent is poured into appropriate containers! Do not discard antifreeze agents in nature!

Protect the manometer against freezing by unscrewing it from the regulator and storing it in a warm room. The manometer must be stored in an upright position or the glycerine filling can flow out.

12.3 BOLT TIGHTENING TORQUE

Thread	Wrench size	Bolt quality				
		5.6	**6.9**	**8.8**	**10.9**	**12.9**
M 4	7	1,4 Nm	2,3 Nm	2,9 Nm	4,1 Nm	4,9 Nm
M 5	8	2,8 Nm	4,5 Nm	6,0 Nm	8,5 Nm	10 Nm
M 6	10	4,8 Nm	7,7 Nm	10 Nm	14 Nm	17 Nm
M 8	13	12 Nm	19 Nm	25 Nm	35 Nm	41 Nm
M 10	17	23 Nm	37 Nm	49 Nm	69 Nm	83 Nm
M 12	19	40 Nm	65 Nm	86 Nm	120 Nm	145 Nm
M 12x1,5	16	-	76 Nm	90 Nm	125 Nm	150 Nm
M 14	22	64 Nm	105 Nm	135 Nm	190 Nm	230 Nm
M 16	24	98 Nm	155 Nm	210 Nm	295 Nm	355 Nm
M16x1,5	24	-	190 Nm	225 Nm	315 Nm	380 Nm
M 18	27	135 Nm	215 Nm	290 Nm	405 Nm	485 Nm
M 18x1,5	24	-	325 Nm	325 Nm	460 Nm	550 Nm
M 20	30	190 Nm	305 Nm	410 Nm	580 Nm	690 Nm
M 22	32	260 Nm	415 Nm	550 Nm	780 Nm	930 Nm
M 22x1,5	32	-	-	610 Nm	860 Nm	1050 Nm
M 24	36	330 Nm	530 Nm	710 Nm	1000 Nm	1200 Nm
M 24*1,5	36	-	-	760Nm	1080 Nm	1270 Nm

13 POSSIBLE ERRORS

SIGNS OF ERROR	POSSIBLE REASON	CHECK / REPAIR
There is no liquid coming out from the nozzles even though the main valve on the flow regulator is opened.	– damaged or incorrectly fitted valves in the pump – closed manual valve on the suction side – clogged suction of pressure filter – air in suction line	- check and if necessary replace valves in the pump; - check the valves in the suction line leading to the pump; - clean or replace the filter insert; - check the tightness of hose junctions on the suction side.
The insecticide jet is unsymmetrical.	- inappropriate pressure in the air chamber.	-check the air pressure in the air chamber and fill it according to the data from chapter 11.1.
The pressure is falling according to the manometer or the working pressure cannot be reached.	- the suction or pressure filter is clogged; - the pressure hose is broken; - the valve of the self-cleaning filter is opened; - incorrectly chosen or too worn nozzle inserts;	- clean or replace the filter insert; - replace the hose; - close the valve of the self-cleaning filter; - check the flow rate through the nozzles – if it is bigger than 10%, replace the nozzles;
The pressure on the manometer is strongly swinging.	- there is some air inside the suction line; - the membranes are damaged.	- check the tightness of the hose junctions on the suction side; - stop the pump immediately; - replace the membranes and the oil inside the pump;
The pump is noisy.	- too low oil level; - exceeded maximum rpm	- control the oil level and add some if necessary; - control the rpm of the pump.
There is some insecticide in the oil of the pump.	- damaged membranes.	- stop the pump immediately; - replace the membranes and the oil inside the pump; - before mounting new membranes, thoroughly clean the inside of the pump with diesel oil.

14 TECHNICAL DATA

14.1 CHARACTERIZATION

The spraying appliances are characterised as follows:

For example: AGS 1000 EN-H; BM 150; PR-3ECFM/5EC+2; 15 MY-H;	
AGS.....	abbreviation for spraying appliances
1000.....	nominal capacity of the reservoir
EN-H.....	version (sprayer with additional reservoirs for ablution and washing hands) and hydraulic spraying equipment
BM 150...	Pump type
PR-3ECFM/5EC+2..	Regulator type
15 MY-H	Working width of the spraying equipment; type of the equipment

All other technical data for individual components (pumps, flow regulator, nozzles,...) can be found in individual chapters.

14.2 DIMENSIONS AND WEIGHT

			SPRAYER TYPE	
SPRAYER WITHOUT EQUIPMENT			**AGS 1000 EN-H**	**AGS 1200 EN-H**
Empty weight of sprayer		kg	355	370
Nominal capacity of main reservoir		l	1100	1298
Nominal capaciy of ablution reservoir		l	100	127,5
Nominal capacity of hand washing reservoir		l	13,7	13,7
Dimensions (without equipment)	Lenght	A(cm)	100	100
	Width	B(cm)	245	245
	Height	C(cm)	209	209

		EQUIPMENT TYPE		
SPRAYING EQUIPMENT		**15MY-H**	**16MY-H**	**18MY-H**
Working width	m	15	16	18
TRI-GET nozzle holders	piece	30	32	36
Number of sections		5	5	5
Distribution of nozzles by sections		5-7-6-7-5	6-7-6-7-6	7-8-6-8-7
Lifting height	cm	117	117	117
Stearing		Hydraulic	Hydraulic	Hydraulic
Weight of the entire equipment	kg	660	665	680

AGS 1000 EN-H			**15MY-H**	**16MY-H**	**18MY-H**
Dimensions (with equipment)	Length	A(cm)	153	153	153
	Width	B(cm)	270	270	270
	Height	C(cm)	300	300	300
Height in transport position		D(cm)	285	285	285
Weight of sprayer and equipment (empty)		kg	1015	1020	1035
Weight of sprayer and equipment (full)		kg	2130	2135	2150
AGS 1200 EN-H			**15MY-H**	**16MY-H**	**18MY-H**
Dimensions (with equipment)	Length	A(cm)	153	153	153
	Width	B(cm)	270	270	270
	Height	C(cm)	300	300	300
Height in transport position		D(cm)	285	285	285
Weight of sprayer and equipment (empty)		kg	1030	1035	1050
Weight of sprayer and equipment (full)		kg	2365	2370	2385
QUICK CONNECTION (optional)					
Weight		kg	30	30	30

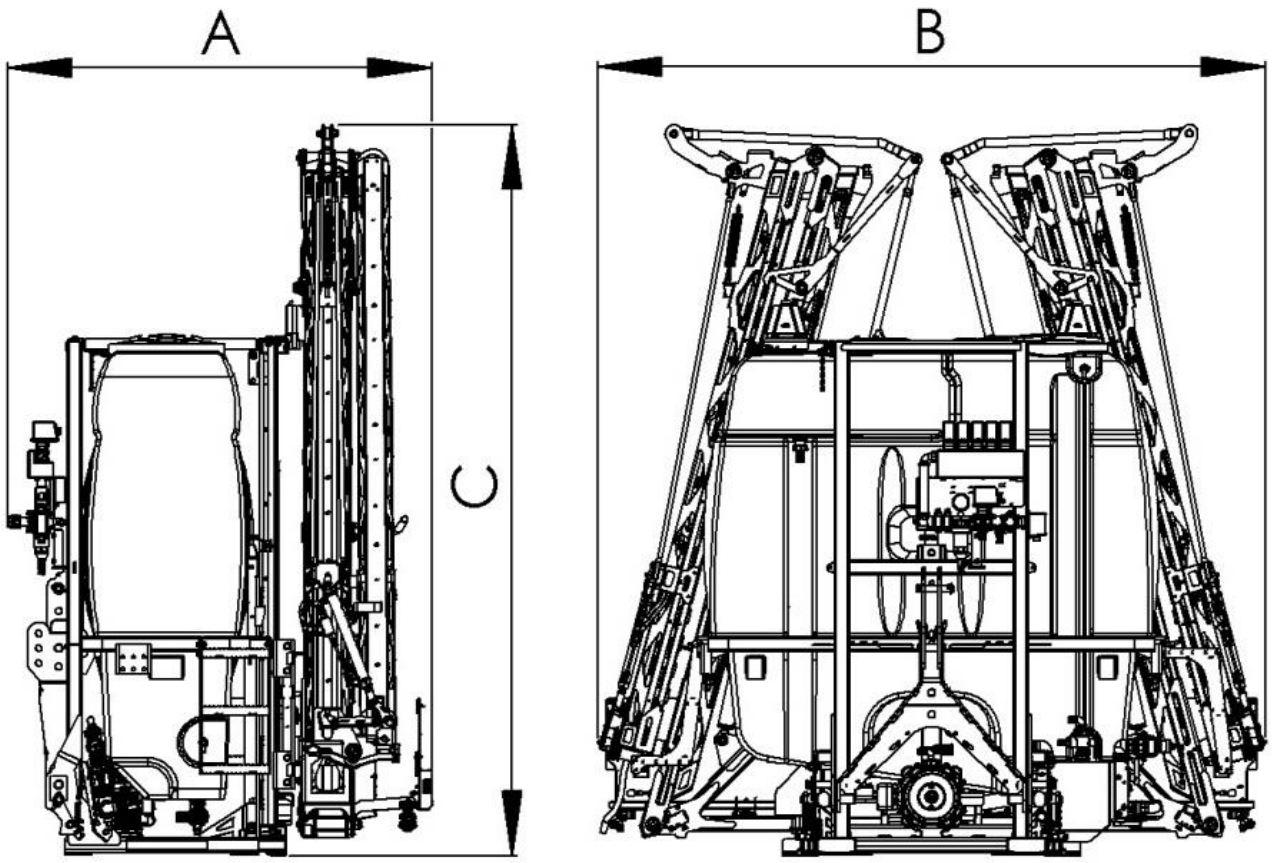


Figure 14.1

14.3 COMBINATIONAL MATRIX

BASIC VERSIONS	SPRAYER TYPE (reservoir capacity)		PUMP	SPRAYING EQUIPMENT TYPE			REGULATION TYPE	
	1000 EN-H (1000 l)	**1200 EN-H (1200 l)**	**BM 150/20**	**15 MY-H**	**16 MY-H**	**18 MY-H**	**PR3 ECF/5EC+2 (Daljinska regulacija)**	**PR3 ECFM/5EC+2 (Elektronska regulacija, AG-TRONIK)**
1	X		X	X	X	X	X	
2	X		X	X	X	X		X
3		X	X	X	X	X	X	
4		X	X	X	X	X		X

14.4 CONNECTION FOR MEASURING FLOW RATE OF PUMP

The flow meter can be connected to the return line of the flow regulator. Remove the hose attachment (code E 19016 – see the picture in the catalogue "flow regulator PR-3) and mount the regulator to its place which is connected through the flow regulator into the reservoir. An enclosed attachment with an appropriate sealing is enclosed with the sprayer.

14.5 CONNECTION FOR PRESSURE MEASURING

The connection for the control manometer has a thread R ¼" and can be found at the upper side of the regulation valve on the pressure regulator (see the picture in the catalogue, "REGULATION VALVE PR-3).
To connect the manometer to the regulator, unscrew the cap (code E 15783) and screw the manometer on the thread.

14.6 MEASURING FLOW RATE OF NOZZLE

To measure the liquid flow rate through the nozzle, you will need a piece of soft flexible hose with an inner diameter of 25 mm or 1" and an appropriate container (it is recommended to use a measuring cylinder). Simply put the hose on the nozzle and measure the liquid flow rate by catching the liquid of individual nozzles into the measuring cylinder. You will also need a stopwatch or a wristwatch. The measurement time is one minute. If you have performed the measurement in less than one minute, calculate the liquid flow rate to one minute.
If the liquid flow rate of a nozzle at a specific pressure exceeds the table values for more than 10% than the nozzle insert is worn and needs to be replaced.

14.7 SPRAYER DISPOSAL

Once the spraying appliance cannot be used anymore, you will have to clean it completely, take it apart and sort the individual components of the sprayer by material. The components must be handed over to an organisation which deals with waste materials. The reservoir and other plastic parts of the sprayer can be recycled or burned in special incineration sites. The metal parts can be sorted out as scrap metal. Consider the local legislation for waste materials.

14.8 MATERIALS AND RECYCLING

RESERVOIR…..PEHD (high density polyethylene)
FLEXIBLE HOSES…..RUBBER, PVC
FRAME…..STEEL
VALVES, REGULATOR, NOZZLE HOLDERS…..more or less PA with fibre glass
NOZZLE HOLDER HOSES…..PE (polyethylene)

15 GENERAL INSTRUCTIONS FOR SPRAYING

WARNING: The machine ISN'T APPROPRIATE TO WORK WITH LIQUID FERTILIZERS!
In case of extraordinary use, we recommend consultation with our technical service!

For a successful spraying, the appropriate water quantity, right nozzle selection and a precise consumption calculation are of major importance. It is recommended to stick to the following order when it comes to preparing of the spraying mixture and spraying:

Make sure that the spraying appliance is in flawless condition. Check the oil level of the pump and clean all filters.

↓

Read the instructions which are attached to the protective agent. Pay special attention to the prescribed concentration, the dose for a hectare and the recommended water consumption.

↓

Choose an appropriate tractor speed and – if you do not have a reliable value – measure it. It is very important to have precise speed values when it comes calculating the quantity of the mixture.

↓

Choose appropriate nozzle type and size according to the crop and required water consumption. Use the nozzle tables.

↓

Fill the reservoir with half of the fresh water you will need.

↓

Adjust the working pressure on the regulator and check the liquid flow rate through the nozzles.

↓

Calculate the required water consumption per hectare according to the measured liquid flow rate through the nozzles and the working speed.

↓

Fill the reservoir with the mixture and add the required water quantity.

↓

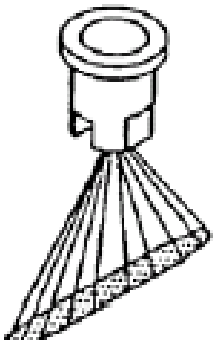
While working, pay attention to a constant working speed, the height of the spraying equipment, the working pressure and nozzle operation.

↓

Clean the sprayer after you finish working.

15.1 NOZZLE TYPES IN FARMING

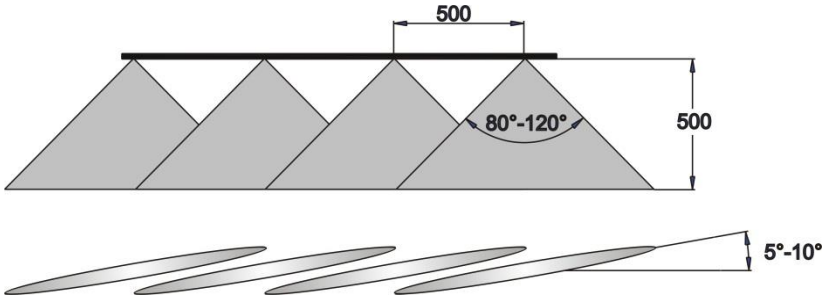
15.1.1 NOZZLE TYPES WITH A FLAT JET



This kind of nozzles is principally used for spraying with herbicides, insecticides and fungicides. The insecticide is precisely distributed along the whole working range of the nozzle. At lower pressure, the drops are bigger and less sensitive to wind and vice-versa. The recommended working height is 0.5 meter above the crop.

Figure 15.1

For reasons of correct overlapping of the jets, the nozzle adjustment is very important. The nozzles must be offset for 5°-10°according to the equipment.



Recommended working pressure:

- Herbicides: 1.5-3 bar
- Fungicides: 3 -5 bar
- Insecticides: 3 -5 bar

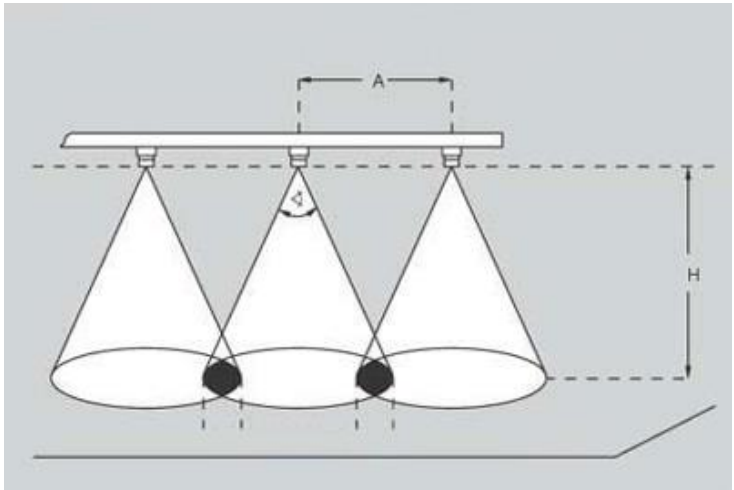
Figure 15.2

15.1.2 WHIRL NOZZLES

The jet of such nozzles in formed like a rotating cone. They consist of a whirling and a spraying part. Spraying parameter settings should be such that the overlap of jets between the two nozzles is minimal.

The main characteristic of these nozzles are smaller drops, the insecticide distribution is worse. They are suitable for spraying with fungicides and insecticides.

- Recommended working pressure: 2 - 10 bar
- Recommended working height: 0.5 meter.



A – Distance between the nozzles
H – Height of nozzles above the crops
Δ – Spraying angle

Figure 15.3

15.2 WIND INFLUENCE

If possible, avoid spraying in windy conditions. If this is not possible, remember the following:

- use special nozzles (“Anti drift”, injection nozzles, etc.)
- use nozzles with larger flow rates
- lower the pressure during spraying
- use nozzles which spray bigger drops (400 μm)
- reduce the working speed

spraye in wind direction.

15.3 WATER CONSUMPTION DURING SPRAYING

Adjust the water consumption to the growth of the crop and the way the protection agent is working which you will be using. Normally, the water consumption per hectare ranges from 100 to 600 litres. When using herbicides, which are commonly sprayed on weedy crops bare of plants, use smaller water quantities (from 100 to 300 litres). Too much water can lower the spraying efficiency, especially when using herbicides which are absorbed through the leaves of the weed. When spraying plants with fungicides and insecticides, a higher amount of water is normally used. Too much water, however, can cause insecticide to drip of the leaves and therefore loss of insecticide.

15.4 TABLES OF NOZZLE FLOW

TABLE 1: Flow rate of LECHLER spraying nozzles (l/min):

THE NOZZLE FLOW RATES ARE ALWAYS THE SAME FOR THE SAME COLOUR MARKINGS OF DIFFERENT TYPES (ST, LU, AD, ID, TR, ETC.) AND NOZZLE MATERIALS.

NUMBER	NOZZLE TYPE	NOZZLE COLOUR	WORKING PRESSURE (bar)						
			2,0	2,5	3,0	3,5	4,0	4,5	5,0
	110015	GREEN	0,48	0,53	0,59	0,63	0,68	0,72	0,76
019.48.062	11002	YELLOW	0,63	0,71	0,78	0,85	0,90	0,96	1,01
019.48.063	11003	BLUE	0,95	1,06	1,17	1,26	1,35	1,44	1,52
019.48.064	11004	RED	1,26	1,42	1,55	1,68	1,80	1,91	2,02
019.48.065	11005	BROWN	1,57	1,77	1,94	2,10	2,25	2,39	2,48
019.48.066	11006	GREY	1,88	2,11	2,32	2,51	2,69	2,86	3,01
019.48.067	11008	WHITE	2,50	2,81	3,08	3,33	3,57	3,79	4,00

TABLE 2: Liquid consumption per hectare (l/ha) according to the flow rate of the nozzle (l/min) and the working speed (km/h) – applies only to spraying equipment with 0.5 meter distance between the nozzles:

	WORKING SPEED (km/h)												
l/min	3,0	3,5	4,0	4,5	4,8	5,0	5,2	5,4	5,6	5,8	6,0	6,5	7,0
0,50	200	171	150	133	125	120	115	111	107	103	100	92	86
0,60	240	205	180	160	150	144	138	133	128	124	120	110	103
0,70	280	240	210	187	175	168	162	156	150	145	140	129	120
0,80	320	274	240	213	200	192	185	178	171	165	160	148	137
0,90	360	309	270	240	225	216	208	200	193	186	180	166	154
1,00	400	343	300	266	250	240	231	222	214	207	200	185	171
1,10	440	377	330	293	275	264	254	244	236	228	220	203	188
1,20	480	411	360	320	300	288	277	267	257	248	240	222	206
1,30	520	446	390	347	325	312	300	289	278	269	260	240	223
1,40	560	480	420	373	350	336	323	311	300	290	280	258	240
1,50	600	514	450	400	375	360	346	333	321	310	300	277	257
1,60	640	549	480	427	400	384	369	355	343	331	320	295	274
1,70	680	583	510	453	425	408	392	378	364	352	340	314	291
1,80	720	617	540	480	450	432	415	400	386	372	360	332	309
1,90	760	651	570	507	475	456	438	422	407	393	380	350	325
2,00	800	685	600	533	500	480	461	444	428	413	400	369	342
2,10	840	720	630	560	525	504	484	466	540	434	420	387	360
2,20	880	754	660	586	550	528	507	488	471	455	440	406	377
2,30	920	788	690	613	575	552	530	511	492	575	460	424	394
2,40	960	822	720	640	600	576	553	533	514	496	480	443	411
2,50		857	750	666	625	600	577	555	535	517	500	461	428
2,60		891	780	693	650	624	600	577	557	537	520	480	445
2,70		925	810	720	675	648	623	600	578	558	540	598	463
2,80		960	840	746	700	672	646	622	600	579	560	517	480
2,90		994	870	773	725	696	669	644	621	600	580	535	497
3,00			900	800	750	720	692	666	643	620	600	554	514

Remark: check the actual flow rate of the nozzles by measuring it. If the flow rate of a nozzle at a specific pressure exceeds the table values for more than 10%, then the nozzle insert is worn and needs to be replaced.

15.5 USE OF TABLES

15.5.1 NOZZLE SELECTION

Example:
You have the following data:

- desired consumption per hectare of 400 l
- working speed: 6 km/h

1. In the speed column for 6 km/h of table 2 find the desired consumption per hectare 400 l/ha.
2. See the flow rate of the nozzle on the left side of the table; in our case, this is 2,00 l/min.
3. Select the appropriate nozzle at specific pressure from table 1: e.g. TABLE 1, nozzle LECHLER, brown colour at a pressure of 3.2 bar.

15.5.2 SELECTING APPROPRIATE SPEED AND WORKING PRESSURE

Example:
- desired consumption per hectare 400 l/ha
- installed LECHLER nozzle, RED colour
- desired pressure between 2 and 4 bar
- desired working speed between 4 and 6 km/h

1. In table 1, find the nozzles, installed in your sprayer. LECHLER RED nozzles have a flow rate of 1.26 l/min at a pressure of 2 bar and a flow rate of 1.8 l/min at a pressure of 4 bar.
2. Find the consumption value of 400 l/ha at a nozzle flow rate between 1.2 and 1.8 l/min in table 2; find the speeds 4-6 km/h in the vertical column.Results:
- 4,5 km/h at a pressure of 2.8 bar
- 4,8 km/h at a pressure of 3.2 bar...

15.6 DIFFERENT CALCULATIONS

The water consumption values can be taken from the tables or calculated in accordance with the following equation:

$$\text{WATER CONSUMPTION PER HECTARE (l/ha)} = \frac{1200 \text{ x NOZZLE FLOW RATE (l/min.)}}{\text{WORKING SPEED (km/h)}}$$

The required flow rate of a nozzle per hectare and the working speed can be calculated with the help of the following equation:

$$\text{NOZZLE FLOW RATE (l/min.)} = \frac{\text{WATER CONSUMPTION PER HECTARE (l/ha) x WORKING SPEED (km/h)}}{1200}$$

The simplest way to determine the tractor's speed is to measure a certain distance and the required time to pass this distance:

$$\text{SPEED (km/h)} = \frac{\text{DISTANCE TRAVELED (m) x 3,6}}{\text{REQUIRED TIME (s)}}$$